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D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. PA-479 DAM (NDI ID NUMBER PA-5--ETC(U)
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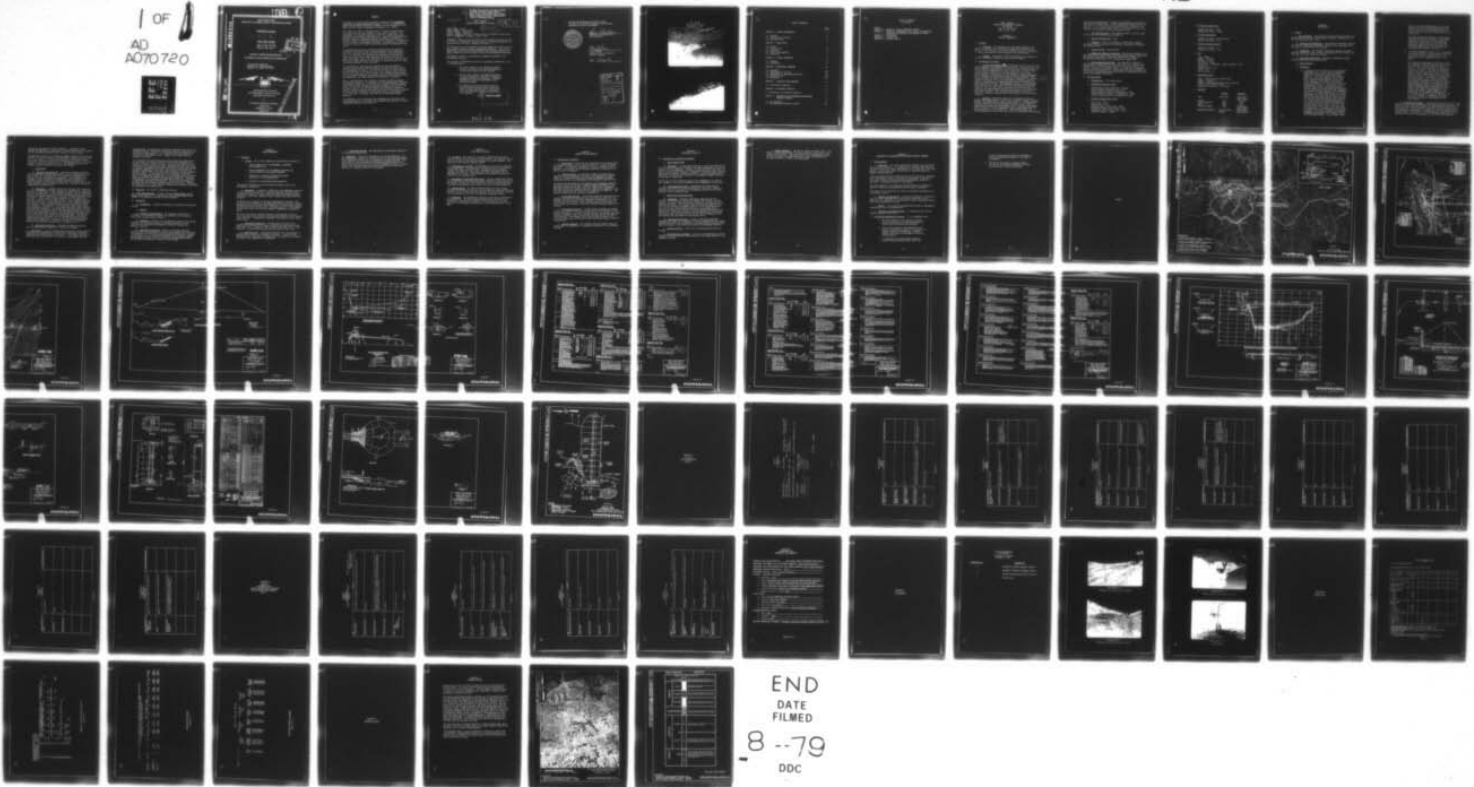
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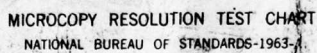
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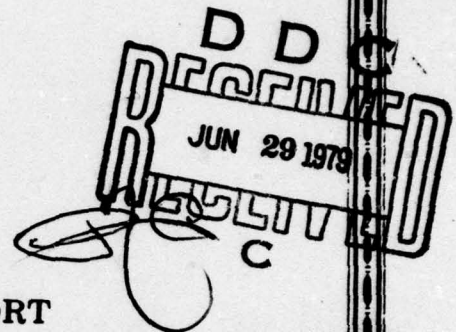
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PA-479 DAM

NDI I.D. NO: PA-509

DER I.D. NO: 63-71



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

✓ D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235
MARCH 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigation and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

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National Dam Inspection Program, PA-479
Dam (NDI ID Number PA-509, DER ID
Number 63-71), Ohio River Basin, Harmon
Creek, Washington County, Pennsylvania.
Phase I Inspection Report.

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P. 1]

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

11 Mar 79

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NAME OF DAM: PA-479
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Washington
STREAM: Unnamed tributary of Harmon Creek, a tributary of Ohio River
DATE OF INSPECTION: December 5 and 21, 1978

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection and as revealed by visual observations, the condition of PA-479 dam is assessed to be good.

The hillside west of the emergency spillway channel was found to be wet and irregular, showing signs of potential instability. It is recommended that this area be closely examined and necessary remedial work done to assure that future slides do not block the emergency spillway.

The spillway capacity is classified as adequate according to the recommended criteria.

The following recommendations should be implemented immediately or on a continuing basis:

1. The slope adjacent to the emergency spillway should be stabilized to prevent development of a slide which would block the spillway.
2. The wet area located on the downstream slope should be periodically observed to document if a seepage condition is developing. Necessary remedial work should be performed if such conditions develop.
3. An around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of an emergency.

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4. The dam and appurtenant structures should continue to be inspected regularly and necessary maintenance should be performed.



Lawrence D. Andersen
Lawrence D. Andersen, P.E.
Vice President

G. K. Withers
G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 22 Apr 79

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PA-479 DAM
NDI I.D. NO. PA-509
DECEMBER 5, 1978



Upstream Face



Downstream Face

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
PA-479 DAM
NDI I.D. NO. PA-509
DER I.D. NO. 63-71

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. The PA-479 dam is one of the 14 flood control projects in the Harmon Creek watershed. The dam consists of an earth embankment approximately 650 feet long with a maximum height of 63 feet from the downstream toe and a crest width of 14 feet. The flood discharge facilities for the dam consist of a drop inlet primary spillway located near the left abutment (looking downstream) and an emergency spillway, also located on the left abutment. The primary spillway is a drop inlet structure consisting of a two-stage reinforced concrete riser, a 24-inch-diameter reinforced concrete conduit, terminating at a plunge pool near the left abutment at the downstream toe of the dam. The emergency spillway is a trapezoidal earth channel with a base width of 50 feet excavated into the left abutment. The reservoir outlet facilities for the dam consist of a 15-inch steel pipe extending from the upstream toe of the dam to the drop inlet structure. Flow through the reservoir outlet is controlled by a manually operated sluice gate located in the drop inlet structure.

[CONT'D
ON P. 11]

b. Location. The dam is located on an unnamed tributary of Harmon Creek, approximately one mile west of Hanlin Station in Hanover Township, Washington County, Pennsylvania (Plate 1). Downstream from the dam, the stream flows approximately 1000 feet north, under the Penn-Central Railroad, and joins Harmon Creek. The first development below the dam is located approximately one mile downstream from the dam and consists of three farmhouses. Harmon Creek crosses the West Virginia/Pennsylvania state line two miles downstream from the dam.

In this reach, approximately 15 homes are considered to be within the flood plain of Harmon Creek. Further downstream, Harmon Creek flows near the town of Collier and joins the Ohio River at Weirton, West Virginia. It is estimated that failure of the dam would cause large loss of life and property damage along Harmon Creek.

c. Size Classification. Intermediate (based on 63-foot height and 343 acre-feet maximum storage capacity).

d. Hazard Classification. High.

e. Ownership. County of Washington, Pennsylvania (address: Mr. Joseph Geicek, Administrative Assistant, Courthouse, Washington, Pennsylvania 15301).

f. Purpose of Dam. Flood control.

g. Design and Construction History. The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service, during 1967. The dam was constructed by Windy Hill Construction Company of Burgettstown, Pennsylvania, with completion in August 1969.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 902.8, the crest level of an orifice on the upstream face of the drop inlet structure. The crest level of the primary spillway is at Elevation 913.5. The crest of the emergency spillway is at Elevation 922.7. Depending on the rate of inflow, the flood would be discharged through the orifice in combination with the primary and emergency spillways.

1.3 Pertinent Data

a. Drainage Area - 1.15 square miles

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - Unknown
Outlet conduit at maximum pool - 58
Gated spillway capacity at maximum pool - N/A
Ungated spillway capacity at maximum pool - 8037
Total spillway capacity at maximum pool - 8095

c. Elevation (USGS Datum) (feet)

Top of dam - 934.2
Maximum pool - 934.2
Upstream invert outlet works - 885.0
Downstream invert outlet works - 879.2
Streambed at center line of dam - 877+
Maximum tailwater - Unknown

d. Reservoir Length (feet)

Normal pool level - 500
Maximum pool level - 1000+

e. Storage (acre-feet)

Normal pool level - 26 (estimated)
Maximum pool level - 343

f. Reservoir Surface (acres)

Normal pool level - 4
Maximum pool level - 18.5

g. Dam

Type - Earth
Length - 650 feet
Height - 63 feet
Top width - 14 feet
Side slopes - Downstream: 2H:1V; Upstream: 3H:1V
Zoning - No
Impervious core - No
Cutoff - Yes
Grout curtain - No

h. Regulating Outlet

Type - 15-inch reservoir outlet pipe
Length - 50+ feet
Closure - Sluice gate at drop inlet structure
Access - Drop inlet structure
Regulating facilities - Sluice gate

i. Spillway

| | <u>Primary</u> | <u>Emergency</u> |
|----------------------|------------------------|---------------------------|
| Type - | Drop inlet | Trapezoidal earth channel |
| Length - | N/A | 50 feet |
| Crest elevation - | 913.5 | 922.7 |
| Gates - | None | None |
| Upstream channel - | Lake | Trapezoidal earth channel |
| Downstream channel - | 24-inch outlet conduit | Trapezoidal earth channel |

SECTION 2 DESIGN DATA

2.1 Design

a. Data Available. The available information was provided by the Pennsylvania Department of Environmental Resources (PennDER) and the Soil Conservation Service (SCS).

(1) Hydrology and Hydraulics. The available information consists of principal freeboard and emergency spillway inflow hydrographs and the results of associated flood routings.

(2) Embankment. The available information consists of design drawings, geology and soils reports, laboratory soil test results, and the results of slope stability analyses.

(3) Appurtenant Structures. Available information includes design drawings and design calculations.

b. Design Features

(1) Embankment

a. As designed, the dam (Plate 2) is a homogeneous embankment with a central cutoff trench and a trench drain beneath the downstream slope (Plate 3). The cutoff trench, with a bottom width of 17 feet, was extended 5 to 10 feet below original ground along the valley floor. On the abutments, the width of the cutoff trench was reduced to 12 feet and the depth was approximately 5 feet. A 4-foot-wide, 10- to 15-foot trench filled with granular material located beneath the downstream slope constitutes the internal drainage system for the embankment (Plate 4). The trench drain starts at a level approximately 30 feet below the dam crest level and 40 feet downstream from the center line of the dam near the right abutment and terminates at a filter blanket near the discharge end of the outlet pipe at an elevation approximately 55 feet below the dam crest and 64 feet downstream from the center line of the dam. Over the lower half of its length, the trench drain is equipped with a 12-inch-diameter perforated drainpipe. On the left abutment, the internal drainage system consists of a minimum 2-foot-thick drainage blanket. This drainage blanket

starts at a level approximately 30 feet below the dam crest and 40 feet downstream from the center line of the dam and terminates at the drainage blanket near the downstream end of the outlet pipe.

Two principal borrow materials for the embankment were classified as follows: clayey sands containing 15 percent gravel and 50 percent fines with a liquid limit of 35 percent and plasticity index of 18, and silty clays containing 83 percent fines with liquid limit of 40 percent and plasticity index of 22.

- b. The dam was designed to have a 3 to 1 (horizontal to vertical) slope on the upstream face with an 8-foot-wide bench at elevation 903.3. The downstream face was designed to have a 2 to 1 slope.
- c. The subsurface investigation conducted for the dam consisted of numerous borings and test pits. The locations of these borings are shown in Plate 2. Selected boring logs are illustrated in Plates 5, 6 and 7. The typical subsurface profile (Plate 8) consists of up to 5 feet of medium to stiff sandy clayey silts on the valley slopes and about 10 to 30 feet of alluvium in the valley bottom. The alluvium is classified as medium dense to dense clayey gravels and clayey sands containing 33 to 56 percent gravel. The bedrock at the dam site consists of thin-bedded Birmingham Shale on the abutments and Pittsburgh Red Bed Shale underlying the valley bottom. The shales were separated by 2- to 3-foot-thick layers of Ames Limestone. The permeability of the bedrock varied between 0.1 foot per day and 8.6 feet per day (4×10^{-5} to 3×10^{-3} ft/sec). In general, the higher permeability rates were encountered in the valley bottom.

(2) Appurtenant Structures. The appurtenant structures of the dam consist of a drop inlet primary spillway and an emergency spillway. The primary spillway structures consist of a single-stage reinforced concrete riser and a 24-inch-diameter reinforced concrete conduit through the embankment, terminating at a plunge pool at the downstream toe of the dam (Plates 9, 10 and 11). A 15-inch-diameter steel pipe from the upstream toe of the dam discharging into the drop inlet structure

constitutes the reservoir outlet facilities. The outlet conduit through the embankment is supported on concrete bedding and is equipped with six reinforced concrete cutoff collars 25 feet on center.

The emergency spillway is a trapezoidal channel excavated into the left abutment. The bottom width of the trapezoidal channel is 50 feet with 2 to 1 side slopes. A 30-foot level section of the channel bottom constitutes the control section of the emergency spillway. The control section is located at Elevation 922.7. The embankment side of the emergency spillway channel is protected with riprap.

c. Design Data

(1) Hydrology and Hydraulics. Available information indicates that the emergency spillway was designed to pass a hydrograph with a peak of 8612 cfs, corresponding to 25.8 inches of precipitation in 6 hours, without overtopping the embankment. This hydrograph was apparently routed through the reservoir starting at normal pool (Elevation 902.8) and producing a maximum pool at Elevation 934.2 with a peak emergency spillway outflow of 8037 cfs. The top of the dam was established at Elevation 934.2.

(2) Embankment. Available information indicates that laboratory tests for the embankment design consisted of classification, compaction, and shear strength tests. Shear strength parameters for the embankment material were obtained from consolidated-undrained triaxial shear tests conducted on samples compacted to 95 percent of maximum Standard Proctor dry density. Total stress strength parameters of two samples were reported. Internal friction angles were 15.5 and 17 degrees and cohesion 500 and 875 psf. It was reported that a slope stability analysis was conducted utilizing modified Swedish circle and modified sliding block analyses. The stability of the downstream slope under steady-state seepage and stability of the upstream slope under rapid drawdown conditions was considered. For steady-state seepage analysis, the pool level was taken at Elevation 922.7, the emergency spillway crest level. The analysis considered a phreatic line from emergency spillway elevation to the trench drain beneath the downstream slope. The minimum computed factor of safety was 1.48 for the downstream slope under a steady-state seepage condition and 1.77 for the upstream slope under rapid drawdown conditions. A stability analysis for the emergency spillway cut indicated a minimum factor of safety of 1.15.

(3) Appurtenant Structures. Available information indicates that the appurtenant structures were standard SCS designs.

2.2 Construction. As-built drawings and construction progress reports prepared by the Commonwealth of Pennsylvania, Department of Environmental Resources were available for review. To the extent that can be determined, the construction of the dam was in conformance with SCS

specifications. No significant construction changes were noted in the embankment design. The dam was constructed under the supervision of an SCS field representative. It is reported that the earthwork was monitored by field density tests. However, the results were not available for review.

It is reported that both during construction and after completion of the dam several landslides occurred on the hillside adjacent to the emergency spillway. The first slide occurred in June 1969 during the excavation of the emergency spillway. Approximately 2000 cubic yards of material was removed from the hillside and the slopes were regraded. The dam was completed in July 1969. The second slide occurred in September 1969; however, the slide did not progress into the emergency spillway channel. In the spring of 1970, additional slides were observed blocking approximately half of the emergency spillway channel. Again, the material was removed and the slopes regraded. A detailed investigation of the condition was undertaken during 1970, including an additional subsurface investigation. The detailed investigation concluded that the permanent solution would be too costly. Therefore, the slide area was to be periodically monitored and necessary maintenance be undertaken as the slides occur.

2.3 Operation. No records of operation are kept.

2.4 Other Investigations. A report entitled, Harmon Creek, PA-479 Slide, dated April 2, 1971, presents the detailed investigation conducted on the emergency spillway stability problem.

2.5 Evaluation

a. Availability. Available information was obtained from SCS and PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. The available information is considered to be adequate to assess the conformity of the design to the current spillway design criteria.

(2) Embankment. Review of the geotechnical aspects of the design indicates that the design generally followed currently accepted practices for subsurface investigation, laboratory testing, and stability analyses.

(3) Appurtenant Structures. Review of the design drawings indicated that the appurtenant structures were designed and constructed in conformance with currently accepted engineering practices. However, concern exists as to the continued stability of the hillside adjacent the emergency spillway, since post-construction engineering studies did not provide a permanent solution to this problem.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of PA-479 dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.
2. Visual examination of the emergency spillway and visual portions of the primary spillway.
3. Observation of factors affecting the runoff potential of the drainage basin.
4. Evaluation of downstream hazard potential.

The specific observations are illustrated in Plate 12 and in the photographs in Appendix C.

b. Embankment. In general, inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

In general, the condition of the dam is considered to be good. Only one wet area was observed on the downstream slope near the left abutment immediately above the outlet works plunge pool. No perceivable seepage was associated with this wet area. The slope adjacent to the emergency spillway was found to be wet and irregular, suggesting a progressing slide.

The top of the dam was surveyed relative to the emergency spillway crest elevation and was found to be within one-half foot of the cambered crest elevation. Irregularities appeared to be caused by truck tracks on the crest.

c. Appurtenant Structures. The appurtenant structures were examined for deterioration or signs of distress and obstructions that would limit flow. In general, the structures were found to be in good condition. No significant deficiencies were noted at this time.

d. Reservoir Area. A map review indicates that the watershed is predominantly covered with reclaimed strip mines. A review of the regional geology (Appendix E) indicates that the slopes of the reservoir are likely to be susceptible to landslides.

e. Downstream Channel. The description of downstream conditions is included in Section 1.2b.

3.2 Evaluation. The dam is considered to be in good condition. The most significant condition at the dam site is the potential instability of the emergency spillway cut, as demonstrated by past problems. This area should be closely examined and necessary remedial work done to assure that future slides do not block the emergency spillway. The wet spot on the downstream slope should also be periodically observed to document if a seepage condition is developing.

SECTION 4 OPERATIONAL FEATURES

4.1 Procedure. The reservoir is normally maintained at the crest level of the orifice on the drop inlet structure. The reservoir outlet pipe can be used to draw down the permanent pool when required. The reservoir outlet gate is normally closed.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be satisfactory. The downstream and upstream faces of the dam are covered with grass and crown vetch. Washington County personnel reported that there is no full-time dam tender responsible for the maintenance of the dam. The maintenance is performed by outside contractors on an as-needed basis.

4.3 Maintenance of Operating Facilities. The only operational feature is the reservoir outlet pipe sluice gate operated by a hoist located on the primary spillway drop inlet structure. Since the drop inlet structure was not accessible, this facility could not be closely examined.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available via homes approximately one mile east of the dam near the community of Hanlin Station. The site is not considered to be readily accessible during major storms.

4.5 Evaluation. The maintenance condition of the dam is considered to be satisfactory. The dam and appurtenances should continue to be periodically inspected with emphasis on the wet areas on the slope adjacent to the emergency spillway and on the downstream slope of the dam.

SECTION 5 HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. PA-479 dam has a watershed of 1.15 square miles and impounds a reservoir with a surface area of 4.3 acres at normal pool level. The emergency spillway of the dam is located on the left abutment. The capacity of the emergency spillway is reported to be 8037 cfs with no freeboard.

b. Experience Data. As previously stated, the PA-479 dam is classified as an intermediate size dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass full PMF.

The PMF inflow hydrograph for the reservoir was determined using the Dam Safety Version of the HEC-1 computer program, developed by the Hydrologic Engineering Center of the U.S. Army, Corps of Engineers. The data used for the computer input are presented in Appendix D. The PMF inflow hydrograph was found to have a peak flow of 3081 cfs. The computer outputs are also included in Appendix D.

c. Visual Observations. As observed during the inspection and as reported from previous investigations, the potential exists for the emergency spillway to be blocked (completely or partially) by a slope failure above the spillway. Such a failure would be more likely to occur during heavy rainfall conditions requiring discharge through the spillway.

d. Overtopping Potential. The PMF inflow hydrograph was routed through the reservoir, and it was found that the dam can pass the PMF without overtopping. To obtain an upper bound on the maximum pool level during the passage of PMF, the spillway discharge rating was conservatively based on a rectangular cross section, with the base of the rectangle taken equal to the base of the trapezoidal emergency spillway cross section.

e. Spillway Adequacy. The spillway capacity (greater than 100 percent PMF) is classified to be adequate according to the recommended criteria.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the embankment. However, it should be noted that since the dam is a flood control facility, it impounds a relatively small reservoir under normal operating conditions relative to its full storage capacity. Therefore, the dam was not subjected to its maximum loading conditions on the date of inspection.

The wet area on the downstream slope is not considered to be significant relative to the overall stability of the embankment at this time.

(2) Appurtenant Structures. Performance of the appurtenant structures is considered to be satisfactory at this time. However, a potential exists for blockage of the emergency spillway with sliding material from the adjacent slope.

b. Design and Construction Data

(1) Embankment. Available information indicates that the stability of the dam was analyzed for steady-state seepage and rapid drawdown conditions using the modified Swedish circle slope stability analysis procedures. The minimum factor of safety was reported to be 1.77 for the steady-state seepage stability of the downstream slope and 1.48 for the rapid drawdown condition of the upstream slope. Strength parameters were obtained from consolidated-undrained triaxial shear tests. Construction progress reports indicate that the dam was constructed under the supervision of an SCS field representative and the earthwork was monitored by field density tests.

(2) Appurtenant Structures. Review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of the appurtenant structures other than the potential slope stability problem in the emergency spillway.

c. Operating Records. There are no operating records kept for the dam.

d. Post-Construction Changes. The only post-construction activity reported at the dam site was the excavation of the slide adjacent to the emergency spillway.

e. Seismic Stability. The dam is located in Seismic Zone 1, and based on visual observations, the static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for the evaluation of seismic stability of dams, the structure is presumed to present no hazard from earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that the PA-479 dam is in good condition. No conditions were observed that would significantly affect the overall performance of the structure at this time. However, as previously noted, the dam was not inspected under its maximum loading condition.

A wet area observed at the downstream face of the dam is not considered to be significant relative to the overall performance of the dam at this time. However, this area should be periodically observed to determine if a seepage condition is developing.

The slope adjacent to the emergency spillway should be stabilized to prevent a slide from developing which would block the spillway.

The capacity of the spillway was found to be adequate according to the recommended criteria.

b. Adequacy of Information. Available information in conjunction with the visual observations and the previous experience of the inspectors are considered to be sufficient to make a reasonable assessment of the condition of the dam.

c. Urgency. The following recommendations should be implemented immediately or on a continuing basis.

d. Necessity for Additional Data. No additional data are considered required at this time.

7.2 Recommendations/Remedial Measures. It is recommended that:

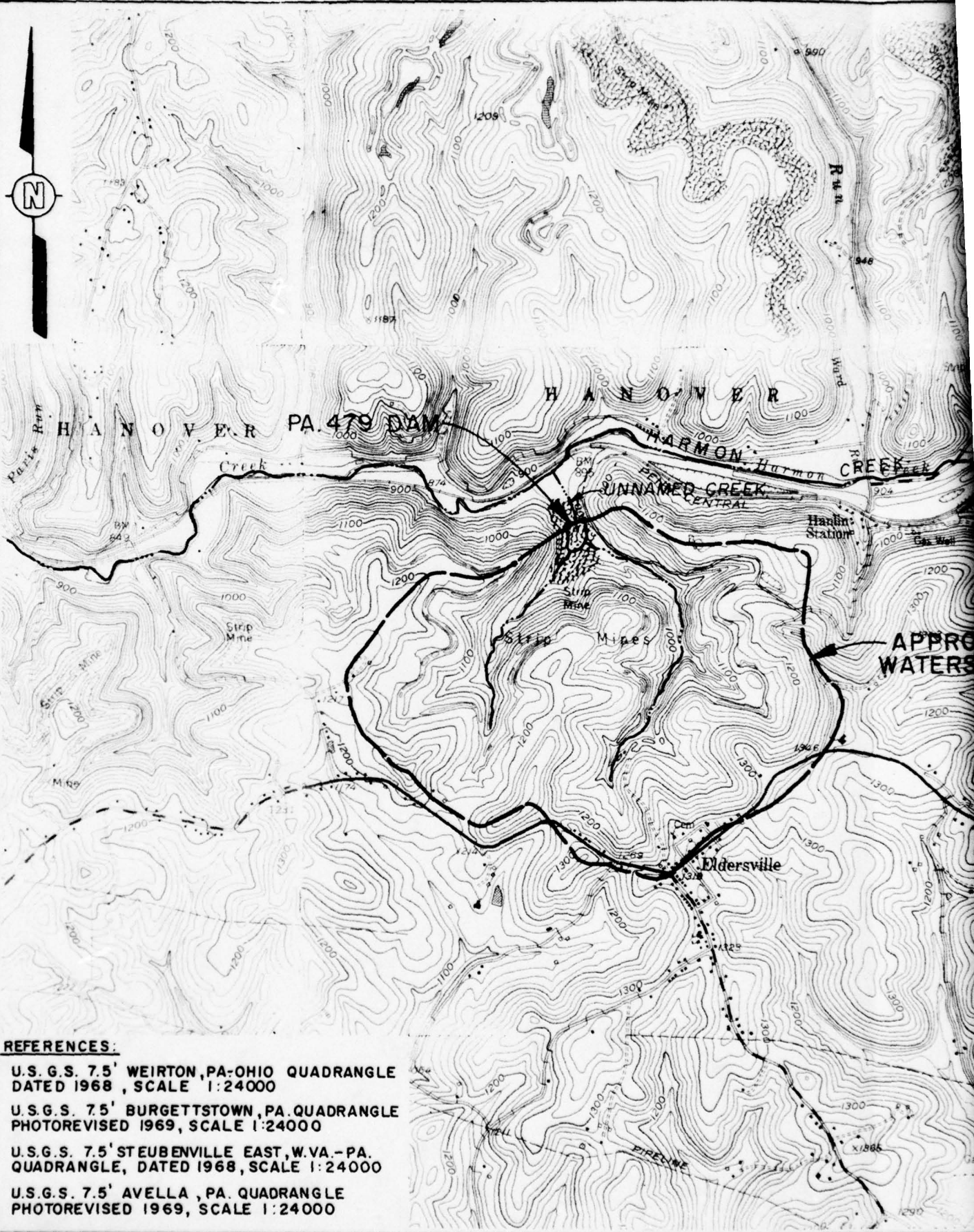
1. The slope adjacent to the emergency spillway should be stabilized to prevent development of a slide which would block the spillway.
2. The wet area located on the downstream slope should be periodically observed to document if a seepage condition is developing. Necessary remedial work should be performed if such conditions develop.
3. An around-the-clock surveillance should be provided during unusually heavy runoff and

a formal warning system should be developed to alert the downstream residents in the event of an emergency.

4. The dam and appurtenant structures should continue to be inspected regularly and necessary maintenance should be performed.

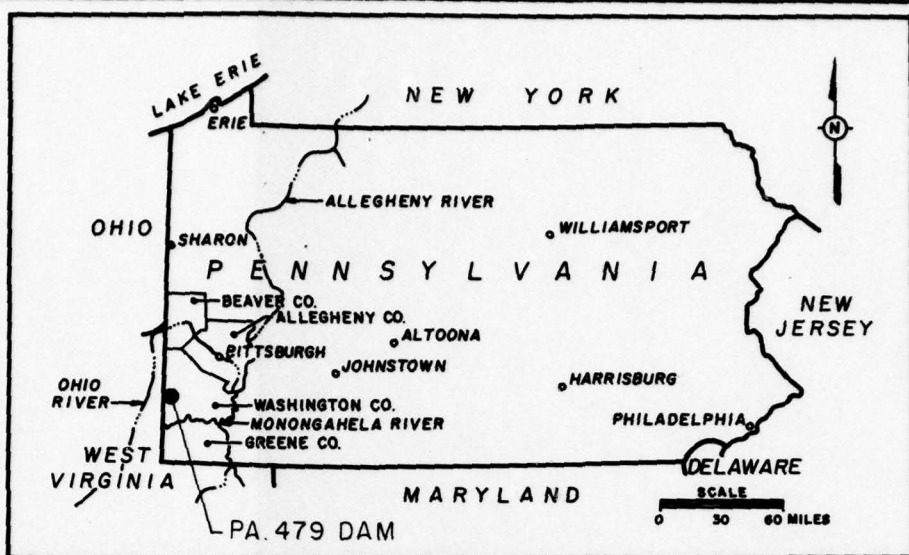
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REFERENCES:

- U.S.G.S. 7.5' WEIRTON, PA-OHIO QUADRANGLE
DATED 1968, SCALE 1:24000
- U.S.G.S. 7.5' BURGETTSTOWN, PA. QUADRANGLE
PHOTOREVISED 1969, SCALE 1:24000
- U.S.G.S. 7.5' STEUBENVILLE EAST, W.VA.-PA.
QUADRANGLE, DATED 1968, SCALE 1:24000
- U.S.G.S. 7.5' AVELLA, PA. QUADRANGLE
PHOTOREVISED 1969, SCALE 1:24000



KEY PLAN

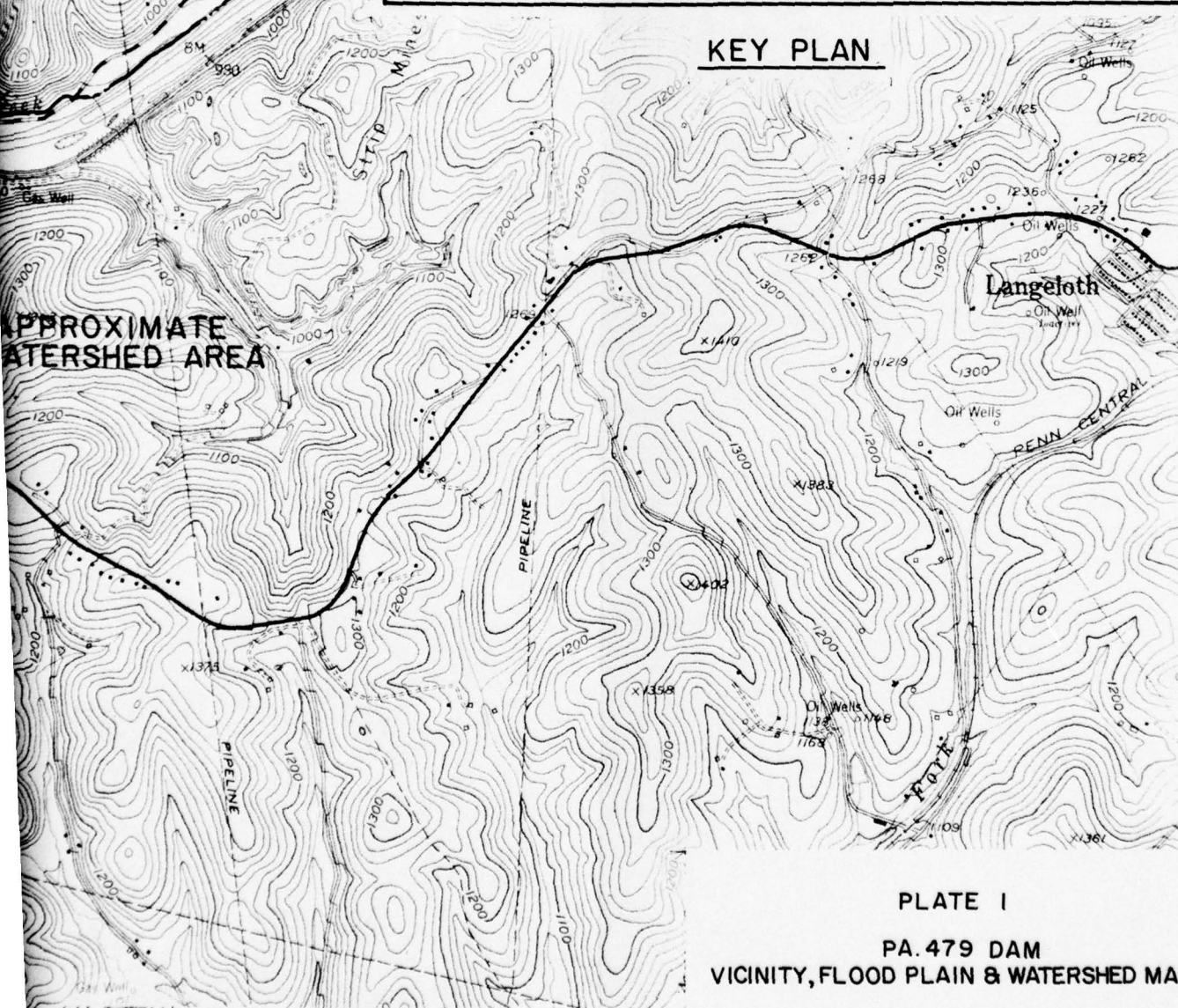
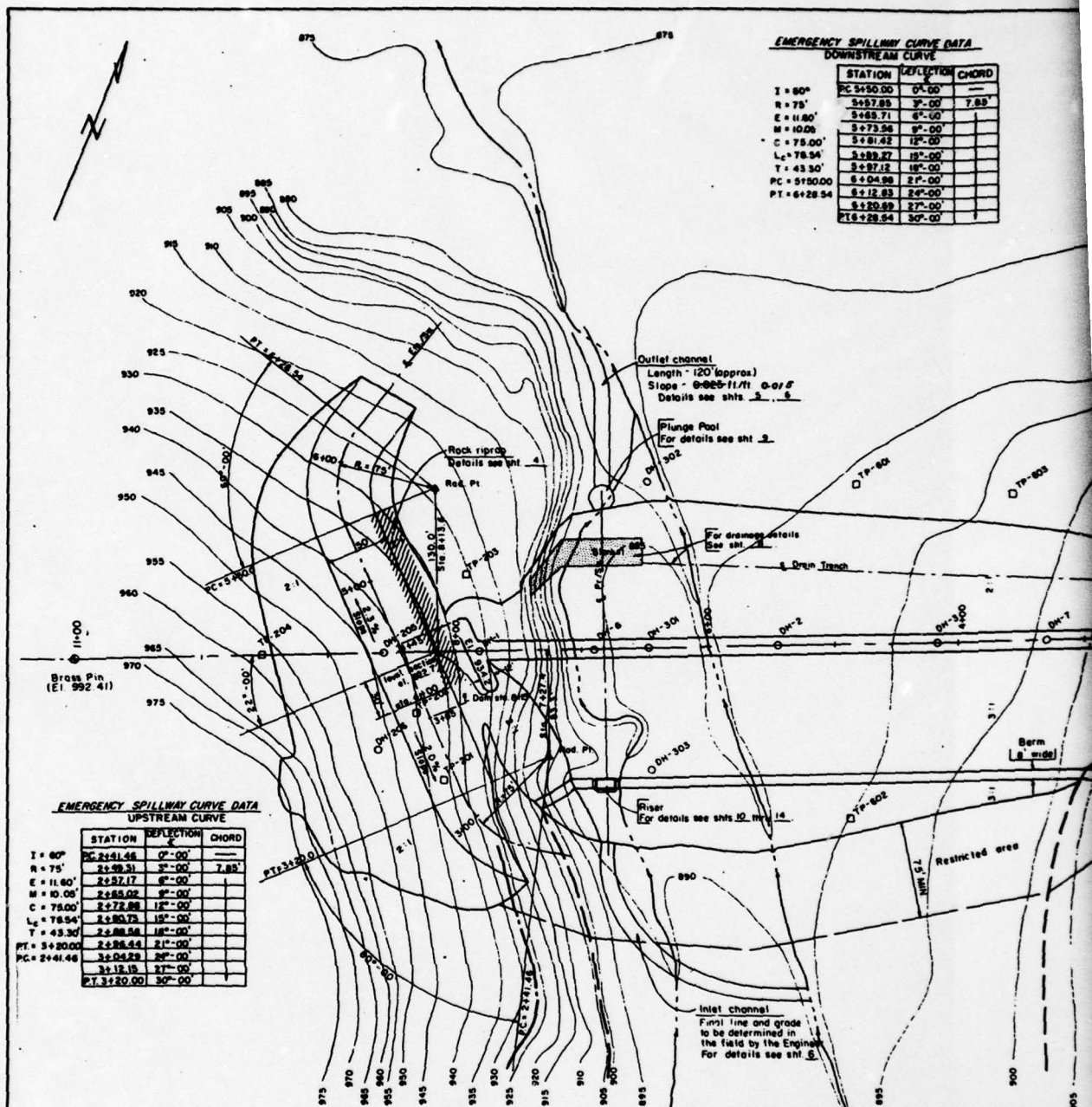


PLATE I

PA. 479 DAM
VICINITY, FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

DRAWN BY ACS CHECKED BY BE 3/1/77 DRAWING 78-367-B53
 1-4-79 APPROVED BY JHP 3.1.77 NUMBER



CONSTRUCTION NOTES

1. For logs of test holes see sh. 17 thru 20.
2. E Dam - E Cut-off trench
3. Contour interval - 5'
4. For E dam layout see sh. 2

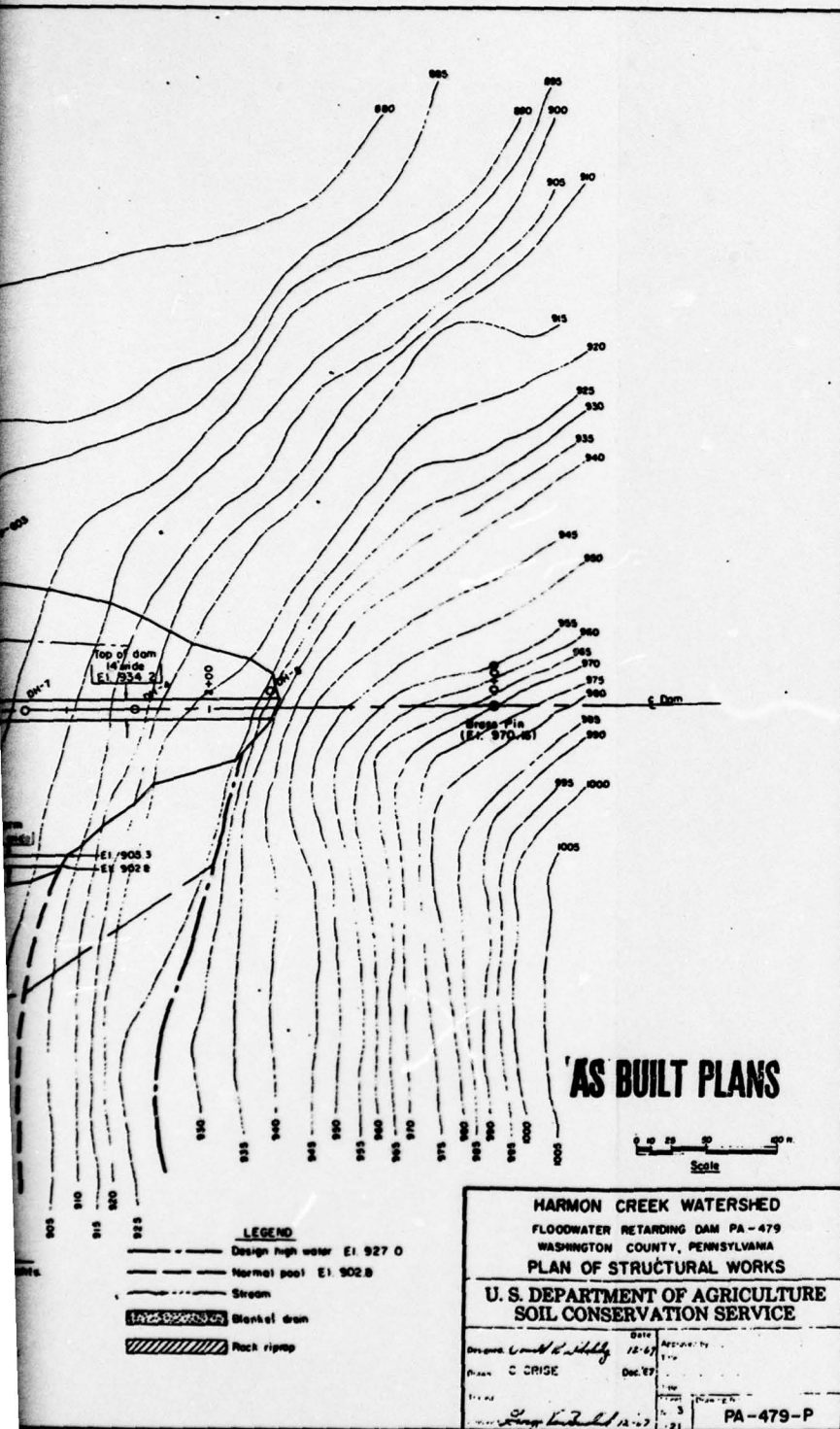
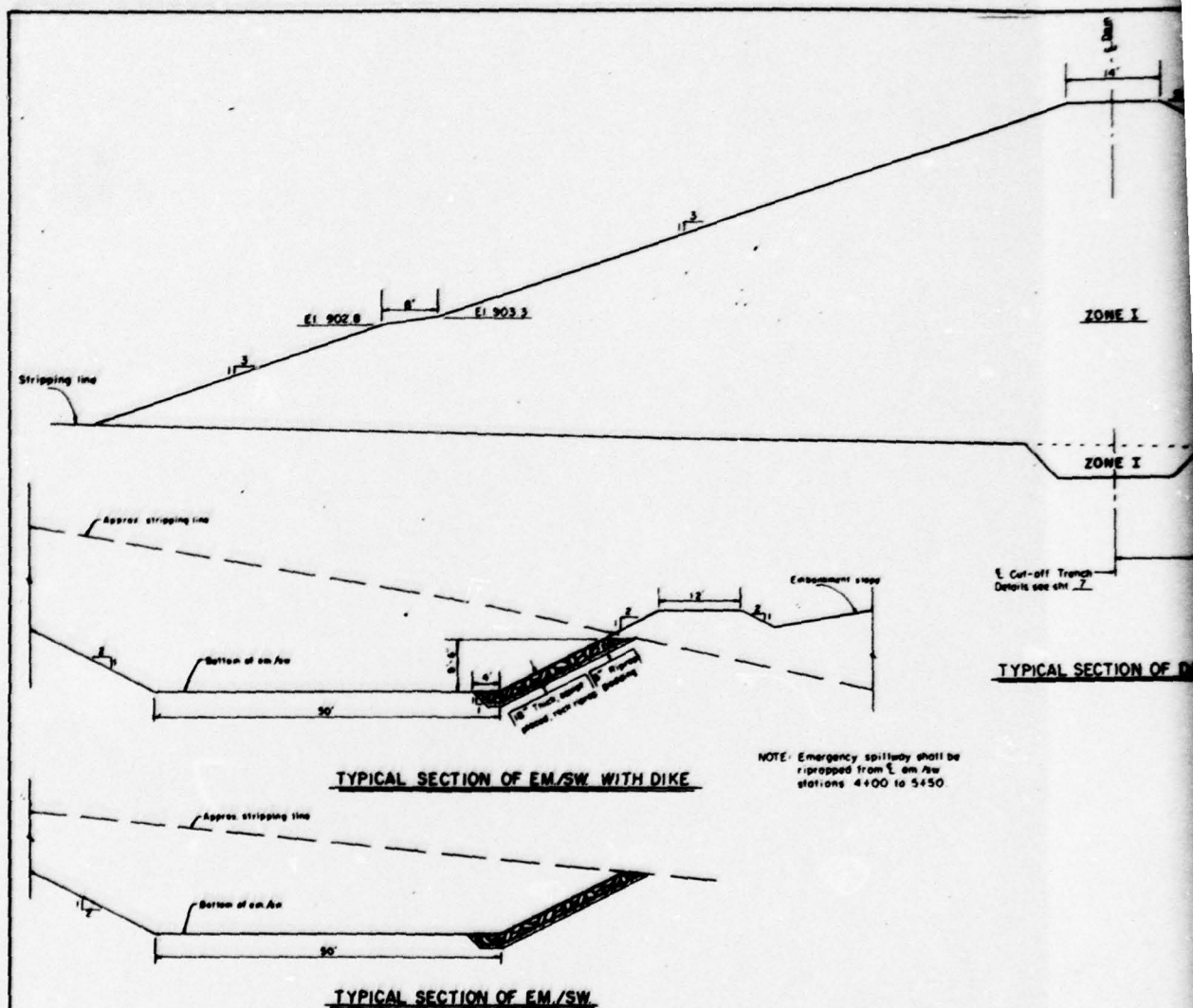
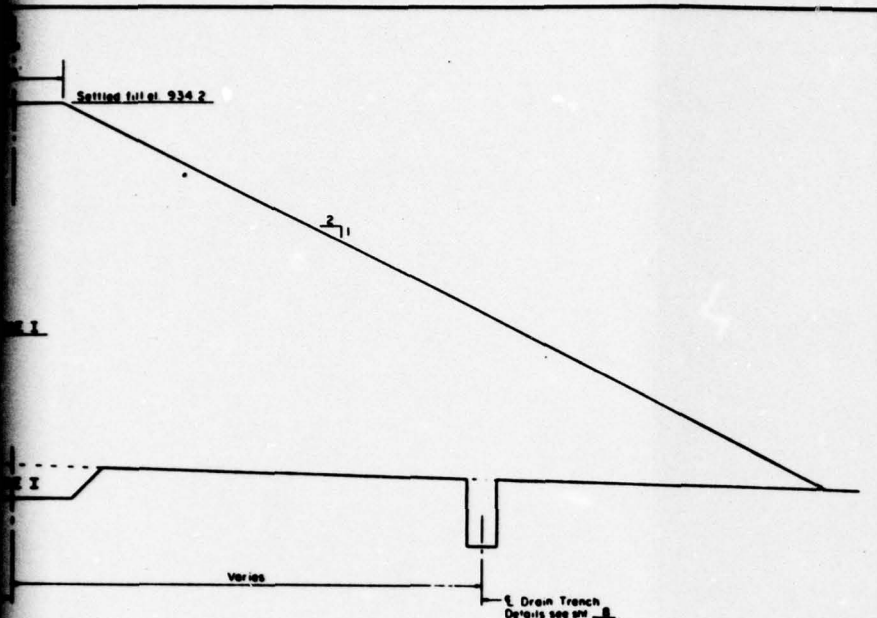


PLATE 2

D'APPOLONIA

**DRAWING
NUMBER** 78-367-854





CONSTRUCTION NOTES

- 1 Constructed slopes are
2.91:1 upstream
1.94:1 downstream
- 2 For constructed fill elevations see sheet 7.

| ZONE | MATERIAL | MAX. ROCK SIZE | MAX. LIFT THICKNESS | REQUIRED WATER CONTENT | COMPACTION | |
|------|--|----------------|---------------------|------------------------|------------|---|
| | | | | | CLASS | DEFINITION |
| I | Material as represented by TP1021, depth 4-5.5' classified as CL; by TP 118.1, depth 15-3' classified as CL. | 6" | 9" | Optimum +4 % 0 % | A | 95% Max. dens., by ASTM D698 Moisture A |

1. For fill adjacent to structures, max. rock size = 3"
2. Maximum permissible lift thickness before compaction
3. Water content of fill matrix at time of compaction
4. For typical compaction curves, see sheet 21

AS BUILT PLANS

0 2 5 10 20

SCALE IN FEET

HARMON CREEK WATERSHED

FLOODWATER RETARDING DAM PA - 479

WASHINGTON COUNTY, PENNSYLVANIA

FILL PLACEMENT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

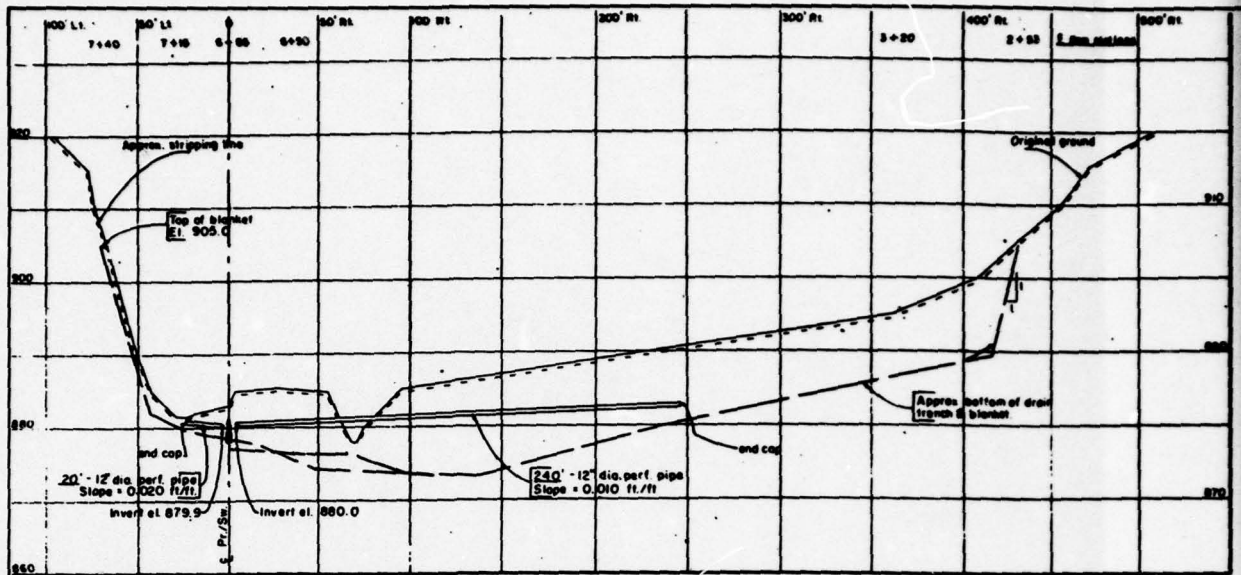
Small R. P. ... 11-57
C. CRIDE 11-57

PA-479-P

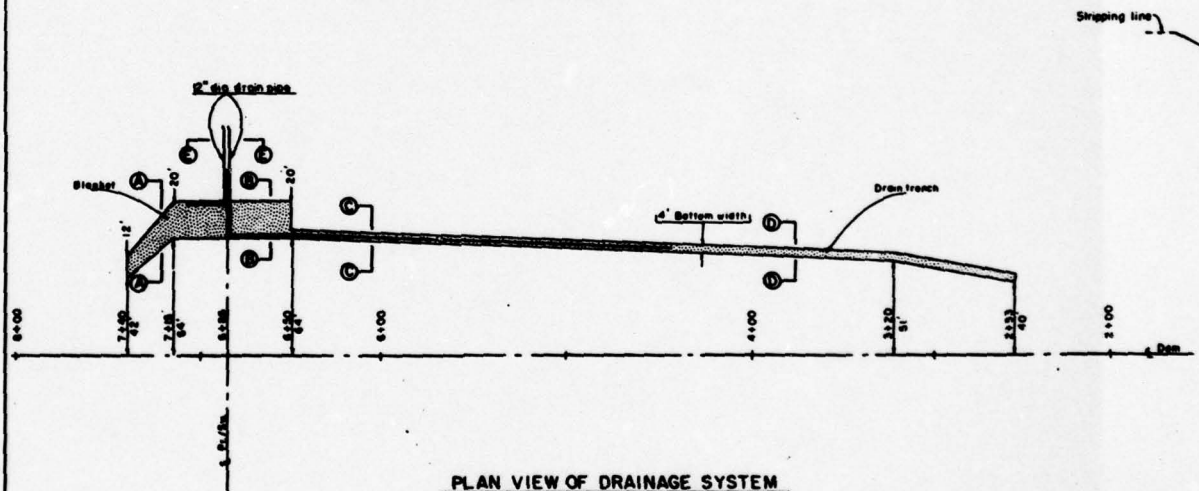
PLATE 3

D'APPOLONIA

DRAWN BY
JHP
CHECKED BY
JHP
APPROVED BY
JHP
DRAWING NUMBER
78-367-B55
DATE
3/1/79



PROFILE ALONG & DRAIN TRENCH
& UPSTREAM EDGE OF BLANKET



PLAN VIEW OF DRAINAGE SYSTEM

CONSTRUCTION NOTE

All drain pipe shall be 12" dia., class I, shape I, type D, 16 gage (material spec. 110)

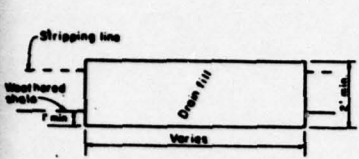
QUANTITY SUMMARY

- 2 - 12' sections of 12" dia. perf. pipe
- 30 - 10' sections of 12" dia. perf. pipe
- 2 - 10' sections of 12" dia. non-perf. pipe
- 2 - 90° elbows (1' x 1-1/2')
- 2 - End caps
- 2 - Small animal guards details see sht. 16
- 349' - Total

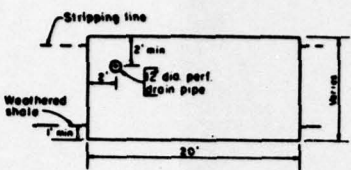
GRADATION LIMITS FOR DRAIN FILL

| FINE DRAIN FILL | |
|-----------------|-------------------------------|
| Sieve No. | % Passing Based on dry weight |
| 1/2" | 100 |
| 3/8" | 94 - 100 |
| no. 4 | 82 - 100 |
| no. 8 | 62 - 94 |
| no. 16 | 42 - 82 |
| no. 30 | 22 - 62 |
| no. 50 | 6 - 38 |
| no. 100 | 0 - 17 |
| no. 200 | < 5 |

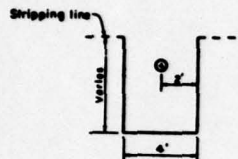
| COARSE DRAIN FILL | |
|-------------------|---------------------------------|
| Sieve No. | % Passing (based on dry weight) |
| 3" | 100 |
| 1-1/2" | 87 - 100 |
| 1" | 83 - 100 |
| 1/2" | 74 - 72 |
| 3/8" | 12 - 93 |
| no. 4 | 0 - 19 |
| no. 8 | < 5 |



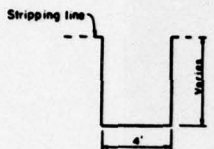
SECTION A-A



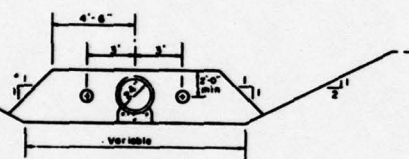
SECTION B-B



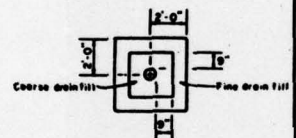
SECTION C-C



SECTION D-D



SECTION E-E



TYPICAL SECTION AROUND ALL PERFORATED DRAIN PIPE

SECTIONS NOT TO SCALE

AS BUILT PLANS

HARMON CREEK WATERSHED
 FLOODWATER RETARDING DAM PA-479
 WASHINGTON COUNTY, PENNSYLVANIA
 DRAINAGE DETAILS
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 Donald R. Kelly 10-67
 C. CHISE 10-67
 PA-479-P

PLATE 4

D'APPOLONIA

MM 1. SLIP. 931.3. 7-80. Centerline
Logged by: M. C. Nisley 8/30/88
William Reinhardt: Sargent & Murray, INC

| Hole Depth | | Description of Materials | Unif. Soil Class | STANDARD PENETRATION | | | | | SAMPLES | | |
|------------|------|--|------------------|----------------------|----------|----------|-------|---------|---------|-----|--|
| From To | | | | Blows Per Ft. | Type Pit | Used No. | Types | From To | % Rec. | | |
| 0.0 | 0.4 | Forest litter, roots, etc. | | 2-3-10-7 | Spt | 1 | Jar | 0.0 | 2.0 | 100 | |
| 0.4 | 7.0 | dark, wet, sandy, cobbles, Cl. has to run back, antler, coverage composition, 100% sandstone, cobbles (2-6"), 100% gravel, 200 sand, some are plastic, from 0.5 to 1.0" gravel up to 200, gravel and sand noncompressible, some coal particles noted | | 10-10-13-10 | " | 2 | " | 2.0 | 4.0 | 100 | |
| | | | | 9-10-10-10 | " | 3 | " | 4.0 | 6.0 | 50 | |
| | | | | 24-10-12 | " | 4 | " | 6.0 | 7.5 | 45 | |
| | | | | 27-36-64 | " | 5 | " | 7.5 | 9.0 | 50 | |
| | | | | | Trt. | | | 10.0 | 7.5 | 0 | |
| | | | | 40-56-74 | Spt | 6 | Jar | 9.5 | 11.0 | 100 | |
| | | | | | Trt. | | | 11.0 | 11.3 | 0 | |
| | | | | | HCU | | | 15.5 | 15.0 | 80 | |
| | | | | | | | | 15.0 | 18.0 | 70 | |
| 7.0 | 0.7 | hard, gravel with clay and cobbles, brown, moist, 200 gravel, 200 sand, 100% small cobbles, fine are plastic, coarse particles are uncompressible. | SC | | | | | 18.0 | 23.0 | 60 | |
| | | | | | | | | 23.0 | 28.0 | 55 | |
| | | | | | | | | 28.0 | 29.5 | 20 | |
| | | | | | | | | 29.5 | 33.0 | 0 | |
| 0.7 | 27.0 | Clay, shale, gray and sh. from 0.7 to 10.0 10.0-21.00, from 0.7 to 10.0 shale laminated and readily breaks down to Cl. with 100% gravel, 200 sand, from 10.0 to 15.0 shale, 100% broken HCU | | | | | | 33.0 | 38.0 | 75 | |
| | | | | | | | | 38.0 | 39.7 | 60 | |
| | | | | | | | | 39.7 | 41.5 | 85 | |
| | | | | | | | | 41.5 | 46.0 | 75 | |
| | | | | | | | | 46.0 | 51.0 | 95 | |
| | | | | | | | | 51.0 | 55.0 | 95 | |

soft, easily broken and scuffed with fingernails, below 16.6 core can be scratched with fingernail, core highly broken in sections with numerous gravel and sand size particles, contains clay strata, core contains vertical fractures, none seen extending, shale clay below 25.0', black shaley coal 16.5-20.5' shale, lt. to med. gry, very lmp, core highly broken with numerous clay strata curved up to 0.1' thick, core can be barely scratched with fingernail, core recovery very poor this section.

33.0 34.6 Silty brown gry, can be scratched with fingernail, core fits fairly well together 33.0-36.0" and 36.0-34.6", remainder of core contains highly broken, some with gravel size pieces, core up to 0.3' long, core readily breaks along smooth horizontal thin bedding planes, highly fractured in some with sand calcite fracture filling below 47.7', some clay strata noted along core, strata up to 0.1' thick, core lmp in some and becomes more lmp with depth.

54.8 55.6 Limestone (Mass), lt. gry, fossiliferous, can be scratched with knife.

55.6 56.6 (27/54) 14.9' MC. (3/2/64) 17.5' MC. (3/2/64) 15.3'

PM 2. KKV. 885.7. 5445. Centerline
Landed by: N. C. Hirschoy 9/8/66
Drilling Equipment: Sargent & Hayward 400

| Soil | | STANDARD PENETRATION | | | | SAMPLING | | | |
|---------|------|--|----------|---------|----|----------|------|------|-----|
| Soil | | Type | | Type | | From | | To | |
| Class | | No. | | No. | | Ft. | | Ft. | |
| From To | | Description of Materials | | From To | | Ft. | | Ft. | |
| 0.0 | 0.5 | Forest litter, roots, etc. | 1-4-8 | Sgt | 1 | Jan | 0.0 | 1.5 | 85 |
| 0.5 | 1.5 | Gravel, sand with clay and pebbles, 15% small cobble, 30% gravel, 20% sand, 30% plastic fines. | 5-10-10 | " | 2 | " | 1.5 | 4.0 | 100 |
| | | | 10-18-17 | " | 3 | " | 4.0 | 6.0 | 100 |
| | | | 18-20-22 | " | 4 | " | 6.0 | 7.5 | 70 |
| 1.5 | 2.7 | Clay, sand, lava, cement, trace of gravel, 20% sand, fines are plastic, contains some highly weathered particles. | 5-12-10 | " | 5 | " | 7.5 | 10.0 | 85 |
| | | | 10-12-10 | " | 6 | " | 10.0 | 12.0 | 85 |
| | | | 12-15-96 | " | 8 | " | 12.0 | 15.0 | 250 |
| 2.7 | 5.4 | Sand, gravel with clay and cobble, lava, cement, gravel, 10% cobble, 10% gravel, 20% sand, 20% plastic fines, average particles are fairly well graded, plenty and abundant, grades into CL. | 22-30-30 | Sgt | 9 | Jan | 15.0 | 16.5 | 85 |
| | | | 30-30-30 | " | 10 | " | 16.5 | 18.0 | 65 |
| | | | 18-24-30 | " | 11 | " | 18.0 | 19.5 | 60 |
| | | | 20-22-30 | " | 12 | " | 19.5 | 21.0 | 60 |
| | | | 22-22-30 | " | 13 | " | 21.0 | 22.5 | 65 |
| | | | 17-22-25 | " | 14 | " | 22.5 | 24.0 | 65 |
| | | | 20-21-20 | " | 15 | " | 24.0 | 25.5 | 60 |
| 5.4 | 7.5 | Clay, sand with gravel, lava, cement, 10% gravel, 20% sand, fines are plastic. | 17-22-27 | " | 16 | " | 25.5 | 27.0 | 65 |
| | | | 30-20-20 | " | 17 | " | 27.0 | 28.5 | 65 |
| | | | 25-10-20 | " | 18 | " | 28.5 | 29.5 | 100 |
| 7.5 | 23.5 | Sand, clay with gravel and cobble, lava to gray, cement to red, average composition, 10% sand, 20% gravel, 20% plastic. | | MCN | | | 29.5 | 34.5 | 40 |
| | | | | " | | | 34.5 | 36.0 | 45 |
| | | | | " | | | 36.0 | 41.0 | 45 |
| | | | | " | | | 41.0 | 46.0 | 45 |

gravel, 15% sand, 25% plastic
fines, coarse particles are
fairly well-graded, sandstone
and shale, clay and sandstone,
lily from approx. 1.5' to 2.0', contains some highly weathered soil particles, grades into
CL below.

20.5 20.5 Clay, sand with gravel, low, wet, CL
trace of cobbles, 15% gravel, 25%
sand, 25% plastic fines, clay.

20.5 20.5 Clay, shale, red-brown to grey, wet,
cut, first foot highly weathered
to CL with 25% sand and moderately plastic fines, very little to 4.0' and lies in
sections to bottom of hole, rock easily scratched with knife, contains clay crusts
intermingled with sand and gravel size fragments, were above pitting from
small extent, dark grey, contains gravel size pieces to 0.5', covered
pieces up to 0.5' in, contains vertical fractures.

bottom of hole - wet hole. M. (2/2/54) 7.0' M. (2/2/54) 7.2'

MI 3. KIV. 892.7. 417. Counterline
 Logged by: S. G. H. Wainey 2/6/66
 Drilling Equipment: Sparrow & Herwood 300

| Hole Depth | | Description of Materials | Unif. Soil Class | STANDARD PENETRATION | | | | |
|------------|------|---|------------------|---|--------------|--|--|--|
| From | To | | | Spill | Type | Head | Blow | Time |
| | | | | Class | Waves | Per Sq" | | |
| 0.0 | 0.5 | Forest litter, roots, etc. | | 1-5-5 | Spt | 1 | Jan | |
| 0.5 | 33.0 | Sand, gravel with clay & cobbles, brown; gray-green & brown below 12.0', moist & wet from 13'. Average compaction. Trace to 10% small cobbles, 20% gravel, 35% sand, fines are plastic, clay below 15'. Particles are platy to sub-round, sandstone & shale, durable to nondurable, particles are fairly well-sorted, contains some highly weathered coal particles, contains some thin lenses of Cl with 20% sand, grades into a brown clay, sand with gravel, brown, wet, trace of cobbles, 15% gravel, 25% sand, 5% plastic fines, clay. | SC | 1-4-4 1-4-4 5-4-4 5-5-7 5-4-8 4-5-5 11-16-23 21-23-27-31 2-36-32-54 | | 2 3 4 6 7 8 11 14 | " " " " " " " " | |
| | | | | 8-13-19-19 15-20-20-15 17-20-20-13 15-16-17-22 15-17-17-21 16-21-27-15 14-15-16-10 16-19-22-32 16-21-21-22 32-90 | Tri. Spt. | 11 12 13 14 15 16 17 18 17 20 | " " " " " " " " " " | 17 18 19 20 21 22 23 24 25 26 |
| 33.0 | 35.7 | Clay, sand with gravel, brown, wet, trace of cobbles, 15% gravel, 25% sand, 5% plastic fines, clay. | CL | | | | | |
| 35.7 | 37.2 | Clay, sandy, gray to red-brown, 20% fine sand, fines are plastic, clay, highly weathered bedrock. | | | NCT | | | |
| 37.2 | 45.5 | Clay, sandy, red-brown & gray, wet, can be scratched with fingernail (some sections easily scratched), clay, conglomeration of sand and gravel, thin clay streaks, vertical clay streaks, pieces up to 0.5' long with broken edges along core with sand and gravel pieces, slicken sides noted at 41.4', 49.0' dip to horizontal, planes of weakness in the rock noted in both horizontal and vertical directions. | | | | | | |
| 45.5 | | Some of bedrock wet hole ML (2/8/66) 13.7 ML (2/2/66) 12.7 | | | | | | |

ILL 3A, ELEV. 892.7, "427, Centerline

| | | | | | | |
|------|------|---|------|-----|------|-----|
| 0.0 | 10.0 | Earth boring | Tri. | 0.0 | 10.0 | 0.0 |
| 10.0 | 12.5 | Attempted denison sample, no recovery | | | | |
| 12.5 | 15.0 | Attempted denison sample, hole caved from 9.0', no recovery | | | | |
| 15.0 | | Bottom of hole - wet hole | | | | |

IN 4. ELEV. 907.3, 251. Counterline
 Logged by: R. C. Hirsley 9/8/66
 Drilling Equipment: Sigsbee 2 1/2" 400

| Hole | Depth To | Description of Materials | Unif. STANDARD NOTATION | | | | | | From |
|------|----------|--|-------------------------|--|----------------------------|----------------------------|----------------------------|--------------------------------------|------|
| | | | Soil Class | Type RCT | Blows Per Ft. | Hard No. | Cov. | | |
| 0.0 | 0.4 | Ferret litter, roots, etc. | | 4-4-12 | Spt | 1 | Jar | 0.0 | |
| 0.4 | 4.5 | Clay, sand with gravel, red-cl hard, to gray-brn, 10% fine gravel, 25. sand fines are plastic, coarse particles are plenty and noticeable, some thin coal beds noted 3.0-4.5'. | | 5-4-10 17-20-22 5-11-14 8-10-18 10-17-27 0-70-122 | " " " " " " | 2 = = = = 7 | = = = = = " | 1.5 2.0 2.5 6.0 7.5 " | |
| 4.5 | 13.2 | Clay, sandy, gray-gy, CL moist to wet at 20' band, fines are moderately plastic, some bedding apparent, highly weathered shale, limy, cured from 10.5'. | | | | 1001 | | 10.5 | |
| | | | | | | | | 13.5 | |
| | | | | | | | | 15.0 | |
| | | | | | | | | 20.0 | |
| | | | | | | | | 25.0 | |
| | | | | | | | | 29.0 | |
| | | | | | | | | 31.0 | |
| 13.2 | 24.0 | Clay, shale, gray-gy to 20.0', med. gray to 24.0', can be easily scratched with finger nail, limy along some sumps, cored pieces up to 0.3' long, core is highly broken with numerous crack places, contains vertical fractures and thin clay strata, some mottled. | | | | | | | |
| 24.0 | 26.0 | Limestone, lt. gray, fossiliferous, easily scratched with coared pieces up to 0.2' long, core highly broken with clay sumps. | | | | | | | |
| 26.0 | 34.0 | Clay, shale, gray to gray-gy, can be scratched with finger nail, cored up to 0.3' long, contains many small cracks, contains some clay strata, staining noted along some fractures and bedding planes, core readily along this bedding planes, limy, core appears to be less weathered than bottom of hole cut here. | | | | | | | |
| 34.0 | | M. (2/2/58) 10.5' M. (2/13/58) 16.8' M. (5/20/58) 14.5' | | | | | | | |

MIL S. FLEV. 926.2. 1+58. 10' D.S.
Logged by: R. G. Hirvonen 9/12/66
Halliburton Geophysical Services, Inc., Houston, Texas

| Hole Depth | | Description of Materials | Type Bit Used | From Ft. | To Ft. |
|---|------|--|---------------|----------|--------|
| From | To | | | | |
| Approx. 3.0' of red clay shale removed in dipping out up for drill rig. | | | | | |
| 0.0 | 14.5 | Clay, shale, red-gray to 10.5', gray-gray with some red ben 10.5 to 12.5' can be heavily crumbled with fingers, very highly broken to 5.5', with highly broken cones along remainder of this section, shale coming through this section, curved pieces up to 0.6' long, thin bedded, approx. 0.3" thick, some readily breaks along the same but small bedding planes, some clay strata, some vertical fractures and iron staining noted. | Res. | 0.0 | 1.0 |
| | | | " | 1.0 | 2.0 |
| | | | " | 3.0 | 4.0 |
| | | | WOOD | 4.5 | 5.0 |
| | | | " | 5.5 | 6.0 |
| | | | " | 6.5 | 7.0 |
| | | | " | 7.5 | 8.0 |
| | | | " | 8.5 | 9.0 |
| | | | " | 9.5 | 10.0 |
| | | | " | 10.5 | 11.0 |
| | | | " | 11.5 | 12.0 |
| | | | " | 12.5 | 13.0 |
| | | | " | 13.5 | 14.0 |
| | | | " | 14.5 | 15.0 |

Continued

10' 5' Cont'd

| From To | Fe. In. | Sec. | Hole Depth From To | Description of Materials | Type | | | |
|---------|---------|------|--------------------|--------------------------|---|---------|---------|------|
| | | | | | Hit | From To | Fe. In. | Sec. |
| 0.0 | 1.5 | 55 | 14.5 | 22.5 | Clay shale, gray to gray, easily scratched with fingernail, covered pieces up to 0.5' long, below 17.0' core very highly broken with some broken ones 1.5-1.0', thin bedded. Some vertical fractures, iron staining noted along bedding planes. | X | 17.5 | 47.5 |
| 1.5 | 3.0 | 70 | | | | | 47.5 | 50.5 |
| 3.0 | 4.5 | 85 | | | | | 50.5 | 55.5 |
| 4.5 | 6.0 | 100 | | | | | 55.5 | 60.5 |
| 6.0 | 7.5 | 115 | 22.5 | 26.5 | Shale-coal, black, easily scratched with fingernail, highly weathered and broken, clay same, limy from 25.0'. | | | |
| 7.5 | 9.0 | 130 | | | | | | |
| 9.0 | 10.5 | 145 | | | | | | |
| 10.5 | 12.0 | 160 | 26.5 | 30.0 | Clay shale, gray to gray, red-brown 15.0-16.5', can be scratched with fingernail, core very highly broken with clay strata to 2.0' and in ones .65 to .55'. Below 15.5' core above now broken ones with some clay strata, especially from 17.0-18.1', 5.1-5.5', and 6.2-6.5' and it appears to be less weathered. Core pieces 5.5-10.0' 0.75 to 0.5' long with one piece 1.5' long, rock is thin bedded approx. 0.02' thick, vertical fractures present, iron staining noted to 10.0', some calcite fracture filling, core to 10.5-15.0' and 16.5-17.0' in zone, plane of weakness appear in core horizontally along bedding planes and vertical along small fractures. | | | |
| 12.0 | 13.5 | 175 | | | | | | |
| 13.5 | 15.0 | 190 | | | | | | |
| 15.0 | 16.5 | 205 | | | | | | |
| 16.5 | 18.0 | 220 | | | | | | |
| 18.0 | 19.5 | 235 | | | | | | |
| 19.5 | 21.0 | 250 | | | | | | |
| 21.0 | 22.5 | 265 | | | | | | |
| 22.5 | 24.0 | 280 | | | | | | |
| 24.0 | 25.5 | 295 | | | | | | |
| 25.5 | 27.0 | 310 | | | | | | |
| 27.0 | 28.5 | 325 | | | | | | |
| 28.5 | 30.0 | 340 | | | | | | |
| 30.0 | 31.5 | 355 | | | | | | |
| 31.5 | 33.0 | 370 | | | | | | |
| 33.0 | 34.5 | 385 | | | | | | |
| 34.5 | 36.0 | 400 | | | | | | |
| 36.0 | 37.5 | 415 | | | | | | |
| 37.5 | 39.0 | 430 | | | | | | |
| 39.0 | 40.5 | 445 | | | | | | |

10' 5' Cont'd
 Logged by: G. L. Hickey 7/21/66
 Drilling Equipment: Sargent & Hornwood

| From To | Fe. In. | Sec. | Hole Depth From To | Description of Materials | Type | | | |
|---------|---------|------|--------------------|--------------------------|---|---------|---------|------|
| | | | | | Hit | From To | Fe. In. | Sec. |
| 0.0 | 0.5 | 15 | 0.0 | 0.5 | Forest litter, roots, etc. | 1-1-1-1 | Sp | 1 |
| 0.5 | 2.0 | 30 | | | Clay, sandy, brown, moist, trace of gravel, 20' sand, fines are moderately plastic, grades into OC below. | 1-1-1-1 | Sp | 2 |
| 2.0 | 3.5 | 45 | | | Gravel, sand with clay, brown, wet, trace of cobbles, no gravel, 25' sand, 30' plastic fines, coarse particles are sub-round and fairly well-sorted sandstone. | | | |
| 3.5 | 10.2 | 117 | | | Shale, clay, med. to dk. gray, can be scratched with fingers (some easily scratched), some zones are limy. Core highly broken with clay strata. Pieces up to 0.25' long, core contains vertical fractures with iron staining. | | | |
| 10.2 | 12.0 | 132 | | | Limestone, (Luna Formation), lt. gray, can be scratched with knife, covered pieces up to 0.5' long, fuselliferous. | | | |
| 12.0 | 25.0 | 37 | | | Clay-shale, gray to gray, red-gray from 17.8 to 21.0', can be barely scratched with knife, limy, contains clay strata, some vertical fractures, no iron staining noted this section, covered pieces up to 0.7' long, some broken on a slight core to 22.0', below 22.0' core fine fairly well-sorted. | | | |
| 25.0 | | | | | Section of hole - wet hole 41' (7/21/66) 1.5' | | | |

10' 5' Cont'd
 Logged by: G. L. Hickey 7/21/66
 Drilling Equipment: Sargent & Hornwood

| From To | Fe. In. | Sec. | Hole Depth From To | Description of Materials | Type | | | |
|---------|---------|------|--------------------|--------------------------|--|---------|---------|------|
| | | | | | Hit | From To | Fe. In. | Sec. |
| 0.0 | 5.0 | 55 | | | Estimated to be similar to 10' 5' to 15.5', clay, sand with gravel, red-brown, 10' gravel, 25' sand, 65' plastic fines | Cl | 17.5 | 12.5 |
| 5.0 | 23.0 | 28 | | | Estimated to be similar to 10' 5' to 15.5' and 17.5' to 21.0', sand, clay with gravel, moist and wet, brown, 20' gravel, 45' sand, 15' cobbles and 35' plastic fines, Spt sample 12.5 to 15.5' confirm estimate. | SC | 17.5 | 12.5 |

Continued

See note, 10' 21

HARMON CREEK WATERSHED
 FLOODWATER RETARDING DAM PA-479
 WASHINGTON COUNTY, PENNSYLVANIA
 LOGS OF DRILL HOLES AND TEST PITS
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

Date: 7/21/66
 Approved by: [Signature]
 Drawn: [Signature]
 Title: [Signature]
 Checked: [Signature]
 PA-479-P

PLATE 5

D'APPOLONIA

DRAWING 78-367-B57

CHECKED BY JSE
APPROVED BY JMD
1-4-79

DRAWN BY

MI 7 Core'd

21.0 10.0 Highly weathered bedrock, clay with sand and gravel, gry, wet. Thin black coal-shale noted in wash water at 21.0'.
 10.0 6.0 Clay shale, gray-gry, very highly weathered, easily scratched with fingernail, limy, clay strata, very poor recovery.
 16.0 42.0 Clay stone, med. gry, some red-gry, 11.3 to 12.0', can be scratched with knife, cored pieces up to 0.7' long, below 10.4' core fits fairly well together with some broken and clayey zones, some from staining to 17.5', some clay strata.
 12.0 Bottom of hole - wet hole
 WL (7/22/66) 17.6'

MI 101, ELEV. 845.7, 644', Centerline
 Logged by: R. G. Hirsley 8/30/66
 Drilling Equipment: Sigsbee 2 1/2" Woodcock

| Hole Depth From To | Description of Materials | Unif. Soil Class Symb. | STANDARD PENETRATION | | SAMPLES | | From To Ft. Fm. | Reg. |
|-----------------------|--|---------------------------------|----------------------|------|----------|------|--------------------|------|
| | | | Blows Per 6" | Type | Used No. | Type | | |
| 0.0 0.4 | Forest litter, roots, etc. | CL | 3-5-10 | Spt | 1 | Jar | 0.0 1.5 | 65 |
| 0.4 3.1 | Clay, sand with gravel, brn, moist, average composition, 1% gravel, 20% sand, fines are plastic, trace of small cobbles, percent of gravel ranges from trace to 25, coarse particles are moderately durable with some nondurable. | CL | 3-6-9 | " | 2 | " | 1.5 3.0 | 65 |
| | | | 5-6-12 | " | 3 | " | 3.0 4.5 | 85 |
| | | | 2-3-5 | " | 4 | " | 4.5 6.0 | 60 |
| | | | 3-7 | " | 5 | " | 6.0 7.5 | 80 |
| | | | 3-6 | " | 6 | " | 7.5 9.0 | 25 |
| | | | 6-100 | " | 7 | " | 9.0 10.0 | 80 |
| 7.1 9.4 | Sand, gravel with clay, gry, wet, 30% gravel, 45% sand, fines are plastic, coarse particles are fairly well graded and moderately durable. | SC | | NCT | | | 10.0 11.0 | 70 |
| | | | | " | | | 11.0 12.0 | 100 |
| | | | | " | | | 12.0 13.0 | 140 |
| | | | | " | | | 13.0 14.0 | 85 |
| | | | | " | | | 14.0 15.0 | 90 |
| | | | | " | | | 15.0 16.0 | 70 |
| 9.0 11.0 | Limestone (Ama formation), lt. gry, can be scratched with knife, fossiliferous. Contains clay and coal seams, core is highly broken to 11.0', pieces up to 0.4' long, clay strata up to 0.2' long. | CL | | " | | | 16.0 17.0 | 70 |
| 14.0 38.5 | Clay shale, lt. to med. gry, 14.0-17.5' and 22.3-25.0', red-brn to gray-gry remainder of core, limy, conglomerate with sand and gravel size inclusions, core contained clay strata and highly broken zones, below 30.5' core fits fairly well together, slicken sides noted at 26.0' dipping 50% from horizontal, cored pieces up to 0.5' long, core can be easily scratched with knife. | CL | | " | | | 17.0 18.0 | 85 |
| | | | | " | | | 18.0 19.0 | 85 |
| | | | | " | | | 19.0 20.0 | 100 |
| | | | | " | | | 20.0 21.0 | 90 |
| | | | | " | | | 21.0 22.0 | 70 |
| 38.5 | Setting of hole - wet hole WL (7/2/66) 5.5' WL (9/7/66) 2.6' | | | " | | | 22.0 23.0 | 70 |

MI 102, ELEV. 881.3, 645', 130' D.S.
 Logged by: R. G. Hirsley 9/7/66
 Drilling Equipment: Sigsbee 2 1/2" Woodcock

| Hole Depth From To | Description of Materials | Unif. Soil Class Symb. | STANDARD PENETRATION | | SAMPLES | | From To Ft. Fm. | Reg. |
|-----------------------|--|---------------------------------|----------------------|------|----------|------|--------------------|------|
| | | | Blows Per 6" | Type | Used No. | Type | | |
| 0.0 0.3 | Forest litter, roots, etc. | CL | 2-3-4 | Spt | 1 | Jar | 0.0 1.5 | 55 |
| 0.3 3.4 | Gravel, sand with clay and cobbles, brn, moist to wet, approx. 15% cobbles, 35% gravel, 25% sand, 25% plastic fines, coarse particles are thin and platy. | CL | 5-3-2 | " | 2 | " | 1.5 3.0 | 80 |
| | | | 12-20-40 | " | 3 | " | 3.0 4.5 | 100 |
| | | | | " | 4 | " | 4.5 6.0 | 100 |
| | | | | " | 5 | " | 6.0 7.5 | 70 |
| 3.4 5.4 | Clay, gravel with sand, brn, wet, 20% gravel, 20% sand, fines are plastic, coarse particles are thin and platy. | CL | | " | | | 7.5 9.0 | 85 |
| 5.4 9.0 | Limestone, from 5.4' to 6.0' highly weathered to CL with trace of fine gravel and 20% sand, fines are plastic, from 6.0' to 8.0' limestone, lt. gry, limy, can be scratched with fingernail, cored pieces up to 0.15' long with numerous gravel size pieces. | CL | | " | | | 9.0 10.0 | 85 |
| 9.0 | Bottom of hole - wet hole WL (9/7/66) 2.5' | | | " | | | 10.0 11.0 | 85 |

MI 103, ELEV. 887.7, 645', 75' D.S.
 Logged by: R. G. Hirsley 9/2/66
 Drilling Equipment: Sigsbee 2 1/2" Woodcock

| Hole Depth From To | Description of Materials | Unif. Soil Class Symb. | STANDARD PENETRATION | | SAMPLES | | From To Ft. Fm. | Reg. |
|-----------------------|---|---------------------------------|----------------------|------|----------|------|--------------------|------|
| | | | Blows Per 6" | Type | Used No. | Type | | |
| 0.0 0.5 | Forest litter, roots, etc. | CL | 1-2-2 | Spt | 1 | Jar | 0.0 1.5 | 55 |
| 0.5 2.5 | Clay, sand, brn to gry, moist to wet, trace of gravel, 20% fine sand, fines are plastic. | CL | 4-2-3 | " | 2 | " | 1.5 3.0 | 45 |
| | | | 5-7-10 | " | 3 | " | 3.0 4.5 | 80 |
| | | | 5-7-100 | " | 4 | " | 4.5 6.0 | 100 |
| 2.5 4.8 | Sand, gravel with clay and cobbles, brn, wet, 10% cobbles, 25% gravel, 3% sand, 30% plastic fines. | SC | | NCT | | | 6.0 7.5 | 55 |
| 4.8 6.0 | Clay, sand with gravel, brn to gry, wet, 10% gravel, 25% sand, fines are plastic, coarse particles are shale. | CL | | " | | | 7.5 9.0 | 85 |
| 6.0 8.0 | Shale, gry to gray-gry, wet, can be scratched with fingernail, cored pieces up to 0.025' long with numerous gravel size pieces, contains flat smooth bedding planes, bedrock appears to be fine at 7.95', limy. | CL | | " | | | 9.0 10.0 | 85 |
| 8.0 | Bottom of pit - wet WL (9/7/66) 2.3' | | | " | | | 10.0 11.0 | 85 |

TP 501, ELEV. 844.5, 4480', 125' D.S.

0.0 0.4 Topsoil, roots, etc.
 0.4 2.5 Clay, sand with gravel, red-brn, moist, 10% fine gravel, 15% sand, fines are plastic.
 2.5 5.0 Gravel, sand with clay, red-brn, moist, wet from approx. 1.5', very slight seepage evident, trace of cobbles, 35% gravel, 20% sand, 40% plastic fines, coarse particles are thin and platy sandstone particles, moderately durable, sandstone can be scratched with knife, this material graded into SC below.
 5.0 9.5 Sand, gravel with clay, red-brn, wet, slight seepage noted from this horizon, fines noted grading from 10 to 30% 5.0 to 6.0' fines are plastic, trace of sandstone cobbles, 25% gravel, 40% sand, coarse particles thin and platy sandstone and shale, gravel particles are fine to med. with some large, particles are nondurable with some moderately durable.
 9.5 Bottom of pit - wet WL (7/12/66) 5.5' WL (7/25/66) 8.0'

TP 502, ELEV. 870.5, 4480', 115' D.S.

0.0 0.5 Topsoil, roots, etc. with some forest litter.
 0.5 8.0 Gravel, sand with clay and cobbles, red-brn, moist 0.5 to 5.5', trace of cobbles, 45% gravel, 20% sand, fines are plastic coarse particles are thin and platy moderately durable sandstone with some nondurable shale, 5.5 to 8.0' wet, with lenses of platy cobbles, cobbles about 15' thick, Lenses 6.1' thick of CL containing 85% plastic fines noted between and this material grades into SC proportionally at 8.0'.
 8.0 10.5 Sand, clay with gravel, red-brn, wet, slow seepage noted in this horizon, trace of sandstone cobbles (3-6'), 25% gravel, 40% sand, 30% plastic, gravel particles fine to med. with some large coarse particles thin and platy, nondurable shale and sandstone.
 10.5 Bottom of pit - wet

TP 503, ELEV. 891.4, 3455', 115' D.S.

0.0 0.5 Topsoil, forest litter, roots, etc.
 0.5 3.0 Clay, sand with gravel, brn, slightly moist, 10% gravel, 15% sand, fines are plastic.
 3.0 6.5 Gravel, clay with sand, red-brn, moist, trace of small cobbles, 35% gravel, 20% sand, 40% plastic fines, coarse particles are moderately durable thin and platy sandstone with some shale, cobbles in thin lenses.
 6.5 10.5 Sand, clay with gravel, red-brn, moist, appears SC to be wet below 8.0', trace of platy cobbles, 20% gravel, 20% sand, 45% plastic fines, coarse thin and platy, nondurable with some moderately durable, gravel is fine to med. with some large, no seepage noted into pit.
 10.5 Bottom of pit - wet

TP 101, ELEV. 937.1, 1480', 100' D.S.

0.0 0.5 Heavy brush litter, roots with some small blocky boulders, sandstone
 0.5 5.5 Clay, sand with gravel, brn, moist, 25 sand, 20 gravel, 55 plastic fines, (average composition). Coarse particles are platy and in random orientation, particles are nondurable shale with some sandstone (highly weathered).
 5.5 6.4 Clay, sandy, red, moist, 15% fine sand, fines are plastic
 6.4 10.5 Shale, highly weathered, calcareous to platy gravel size pieces, shale thin bedded and ranges from gray to red, particles are nondurable, readily breaks along cleavage and bedding planes.
 10.5 Bottom of pit - dry

TP 102, ELEV. 920.6, 1480', 100' D.S.

0.0 0.5 Topsoil, forest litter, roots, etc.
 0.5 12.0 Clay, sand with gravel, brn, moist, 20% gravel, 50% sand, fines are plastic, coarse particles are platy and nondurable shale with some sandstone, trace of small cobbles, micaceous sandstone, material contains some coal particles.
 12.0 Bottom of pit - dry

TP 103, ELEV. 950.5, 0-20', 100' D.S.

0.0 0.5 Forest litter, roots with a few small sandstone boulders.
 0.5 11.0 Clay, gravel with sand, brn with some red 3 to 4', moist, average comp. 20 gravel, 1% sand, fines are plastic, coarse particles are thin and platy nondurable shale with some sandstone, trace of small cobbles and boulders, sandstone is moderately durable, cobbles found in thin lenses, test pit, material contains some coal particles.
 11.0 Bottom of pit - dry WL (7/22/66) 10.0'

TP 104, ELEV. 981.0, 0-20', 500' D.S.

0.0 0.5 Topsoil, roots, etc., some small boulders noted.
 0.5 6.0 Clay, gravel with sand, brn to red, moist, trace of small sandstone and 20% gravel, 15% sand, fines are plastic, coarse particles are thin and shale with some sandstone, coarse particles are nondurable, easily sand and broken with fingernail, material contains some coal particles.
 6.0 7.5 Gravel, sand with clay, red to gry to yellow, wet from 7.0', highly weathered shale bedrock containing 30% plastic fines, shale particles are thin and platy, easily broken with fingernail, nondurable.
 7.5 12.5 Gravel with sand, red to gry, wet, highly weathered shale bedrock, shale readily along bedding and cleavage planes, particles are nondurable, can be scratched with fingernail.
 12.5 Bottom of pit - wet WL (7/22/66) 8.0'

NOTE: TEST PITS ARE TO BE MADE UP TO 10' FROM TOP OF PIT

| From To | 1 | 2 | 3 | Notes | |
|---|------|---|---|--|----|
| To | 1 | 2 | 3 | 1 | 1 |
| 1.0 | 2.5 | | | | |
| 2.5 | 5.0 | | | | |
| 0.0 | 9.5 | | | | |
| TP 105. ELEV. 916.8, 0-20, 1100' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 1.0 | | | Forest litter, roots with cedar (?) and GP fill | |
| 1.0 | 11.0 | | | Clay, gravel with sand, cobbles and boulders, red-brn to yellow-brn, moist, appears to be wet below 8.0', boulder, sandstone, highly weath-red noted from 1.0 to 5.5', average composition, 10 small boulders, trace of s-all sandstone cobbles, 20 gravel, 10 sand, fines are plastic, one lens of CL containing "C" fines noted along test pit, some coal particles found in this material. | CL |
| 11.0 | | | | Bottom of pit - dry ML (7/22/66) dry | |
| TP 106. ELEV. 900.1, 0-20, 900' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.5 | | | Topsoil with some forest litter, roots, etc. | |
| 0.5 | 4.5 | | | Gravel, sand with clay, red-brn, slightly moist 0.5 to 4.0, moist from 4.0, average composition, trace of cobbles, 15 gravel, 20 sand, fines are plastic, coarse particles thin and platy sandstone with some shale, fine and sand portion of material increase to CL proportions at 4.5', some coal particles within material. | C |
| 4.5 | 10.5 | | | Clay, sand with gravel, red-brn, moist, appears to be wet from 7.0', no seepage into pit, trace of small cobbles, 15 fine to med. gravel, 30 sand, fines are plastic, coarse particles are thin and platy and nondurable. | CL |
| 10.5 | | | | Bottom of pit - wet ML (7/22/66) dry | |
| TP 107. ELEV. 903.5, 0-20, 900' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.5 | | | Topsoil, roots with some forest litter. | |
| 0.5 | 10.0 | | | Clay, gravel, sand with cobbles and boulders, red-brn, slightly moist to 3.0', moist 3.0 to 6.5', wet 6.5 to bottom of hole, average composition for entire hole, trace of boulders, 10 cobbles, 25 gravel, 15 sand, fines are plastic, below 6.0' pit contained 10 small boulders and 15 small cobbles-sandstone with lenses of CL with 45% fines and -C | CL |
| 10.0 | | | | Bottom of hole - wet ML (7/22/66) 7.5' | |
| TP 108. ELEV. 910.7, 0-20, 900' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.5 | | | Forest litter, roots, etc. | |
| 0.5 | 5.0 | | | Clay, gravel and sand, red, brn, slightly moist to 1.5', moist below 1.5' average composition, 15 gravel, 15 sand, fines are plastic, gravel is fine to med. | C |
| 5.0 | 11.0 | | | Clay, sand and gravel with cobbles, red-brn with some black, moist, appears to be wet below 8.0', trace of sandstone cobbles, cobbles are thin and platy, 25 sand, 20 gravel, fines are plastic, below 8.0' fines decrease to 45% (CL proportions) and gravel is fine to med. Some 0.5' lenses of CL with organic inclusions are found below 8.0', cobbles are found in thin lenses, coarse particles are moderately durable with some nondurable, no seepage noted in test pit. | CL |
| 11.0 | | | | Bottom of pit - dry | |
| TP 109. ELEV. 916.2, 0-20, 900' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.3 | | | Forest litter | |
| 0.3 | 10.0 | | | Shale, highly weathered, olive to red-brn, readily breaks along bedding; and joint and cleavage planes into fine to med. gravel size pieces, trace of clay present, shale is easily scratched with fingernail and pieces are nondurable. | C |
| 10.0 | | | | Bottom of pit - dry | |
| TP 110. ELEV. 924.2, 0-20, 900' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.5 | | | Topsoil, roots, etc. | |
| 0.5 | 10.0 | | | Clay, sand with gravel, brn to red-brn and yellow-brn; blue-gray 1.0-10.0', moist, thin lenses of platy shale cobbles at 4.0', a few small cobbles noted within material, average matrix, 10 gravel, 15 sand, fines are plastic, coarse particles are nondurable, soil is liny from 2.0 to 6.0'. | CL |
| 10.0 | | | | Bottom of pit - dry | |
| TP 111. ELEV. 925.0, 0-20, 1100' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.5 | | | Forest litter, roots, etc. | |
| 0.5 | 2.5 | | | Clay, gravel with sand, brn, slightly moist, 15 gravel, 15 sand, fines are plastic. | CL |
| 2.5 | 5.5 | | | Gravel, sand with clay, red-brn to yellow-brn, moist, trace of small cobbles, 30 gravel, 20 sand, 45 plastic fines, coarse particles are thin and platy and angular, random orientation, particles are sandstone, nondurable. | C |
| 5.5 | 8.0 | | | Clay, gravel with sand, red-brn to yellow-brn, moist, 15 gravel, 15 sand, fines are plastic, coarse particles are sandstone and slate, large blocky sandstone boulder 6.0-6.5', coarse particles are nondurable. | CL |
| 8.0 | | | | Bottom of hole - wet ML (7/22/66) 7.2' | |
| TP 112. ELEV. 1011.6, 0-20, 1100' U.S. | 1 | 2 | 3 | 1 | 1 |
| 0.0 | 0.5 | | | Forest litter, roots, etc. | |
| 0.5 | 5.0 | | | Clay with gravel and sand, red and yellow-brn, moist, 10 nondurable sand, 15 gravel, fines are plastic, highly weath-red bedrock. | C |
| 5.0 | 10.5 | | | Silt with gravel and sand, red and yellow-brn with some lt. gray, liny, highly weathered siltstone bedrock with about 75 low plastic fines, coarse particles appear in thin beds through material. | |
| 10.5 | | | | Bottom of pit - dry | |
| See note, see 21 | 1 | 2 | 3 | 1 | 1 |
| Unified classification by laboratory analysis | 1 | 2 | 3 | 1 | 1 |

| | |
|--|-------------------------------|
| HARMON CREEK WATERSHED FLOODWATER RETARDING DAM PA-479 WASHINGTON COUNTY, PENNSYLVANIA LOGS OF DRILL HOLES AND TEST PITS | |
| U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | |
| Prepared by R. H. Higney Date 1-67 Checked by J. H. Higney Date 1-67 Approved by J. H. Higney Date 1-67 PA-479-P | Repeating for PA-479-P |

| HARMON CREEK WATERSHED | | | |
|-----------------------------------|-----------|-------------|--|
| FLOODWATER RETARDING DAM PA-479 | | | |
| WASHINGTON COUNTY, PENNSYLVANIA | | | |
| LOGS OF DRILL HOLES AND TEST PITS | | | |
| U. S. DEPARTMENT OF AGRICULTURE | | | |
| SOIL CONSERVATION SERVICE | | | |
| Designed by R. H. Hickey | Date 1-67 | Approved by | |
| Drawn | | Field | |
| Typed | | Checked | |
| | | Reviewed by | |
| | | PA-479-P | |

PLATE 6

D'APPOLONIA

DRAWN BY ACS CHECKED BY BE 3/1/73 DRAWING 78-367-B58
 1-4-79 APPROVED BY JHP 3.1.73 NUMBER

TP 111. ELEV. 971.5, 2-80, 1100' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 2.5 Clay, gravel with sand, brn, slightly moist, 20% gravel, 15' sand, fines are plastic, coarse particles are thin and platy sandstone.
- 2.5 6.0 Clay with gravel and sand, red-brn, with yellow and grey mottling, 10' gravel, 10' sand, fines are plastic, coarse particles are nondurable siltstone, highly weathered siltstone bedrock?
- 6.0 8.5 Clay with gravel and sand, red-brn with yellow and grey mottling, 20' fine gravel, 25' sand, fines are plastic, coarse particles are nondurable siltstone particles, highly weathered siltstone bedrock?
- 8.5 Bottom of pit - dry

TP 112. ELEV. 969.2, 2-80, 700' U.S.

- 0.0 0.5 Swamp muck, roots, etc. - wet
- 0.5 5.5 Gravel, clay with sand and cobbles and boulders, brn, wet, 10' small boulders, 15' cobbles (1/2 over 6"), 15' gravel, 20' sand, 10' plastic fines, coarse particles are thin and platy, angular, sandstone, moderately durable to durable.
- 5.5 Bottom of pit - wet hole - Swamp conditions noted immediately upstream from trap pit, between small streams

TP 113. ELEV. 891.2, 5-80, 800' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 5.0 Silt, gravel with sand, brn, slightly moist to 3.5', moist from 3.5 to 5.0', 20' gravel, 15' sand, fines are nonplastic
- 5.0 9.5 Gravel, sand with clay, cobbles and boulders, brn, wet below 3.0', trace of small boulders, 15' cobbles (1/2 over 6"), 10' gravel, 20' sand, 30' plastic fines, coarse particles are thin and platy, moderately durable with some durable, gravel and sand size pieces show evidence of rounding, some coal particles are present.
- 9.5 Bottom of pit - wet hole. WC (7/22/66) 5.0'

TP 114. ELEV. 897.3, 5-80, 500' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 2.5 Silt, gravel with sand, brn, moist, 20' gravel, 15' sand, fines are nonplastic, coarse particles are platy and moderately durable.
- 2.5 8.5 Gravel, clay with sand and cobbles, brn, wet below 3.0', trace of small boulders, 15' cobbles (1/2 over 6"), 10' gravel, 20' sand, 30' plastic fines, coarse particles are thin and platy sandstone, moderately durable, some rounding evident on gravel and sand size particles, moderate seepage into pit. Some black organic deposits were found around some boulders and cobbles, some coal particles are present.
- 8.5 Bottom of pit - wet hole. WC (7/22/66) 4.0'

TP 117. ELEV. 710.6, 7-80, 700' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 9.5 Gravel, sand with clay, cobbles, red-brn, slightly moist to 2.0', moist from 2.0' to bottom of pit, trace of boulders, 10' cobbles (1/2 over 6"), 10' gravel, 20% sand, 35' plastic fines, material variable along pit, the above is an average composition, cobbles and boulders are found in thin lenses, coarse particles are thin and platy sandstone moderately durable with some durable. Some black organic deposits were found around some cobbles and boulders. Some coal present.
- 9.5 Bottom of pit - dry hole.

TP 118. ELEV. 767.2, 7-80, 500' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 6.0 Clay with gravel and sand, red-brn with some yellow mottling, moist, 10' gravel, 15' sand, fines are plastic, coarse particles are platy, thin, and nondurable shale with some sandstone.
- 6.0 7.5 Gravel, cobbles with sand, boulders and clay, red-brn, wet below 6.5', moderate seepage into pit, approx. 10' boulders, 30' cobbles (1/2 over 6") 25' gravel, 15' sand, 20' plastic fines, coarse particles are sandstone, platy, moderately durable with some durable.
- 9.5 Bottom of pit - wet hole. WC (7/22/66) 3.5'

TP 119. ELEV. 735.5, 7-80, 300' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 6.5 Clay with gravel and sand, red-brn with yellow mottling, moist, 15' gravel, 15' sand, fines are plastic, coarse particles are nondurable shale, easily scratched with fingernail, a few sandstone cobbles noted.
- 6.5 10.0 Siltstone, grn-gr to red-brn, moist, barely scratched with fingernail, moderately durable, bedrock highly weathered and excavated as gravel size pieces, breaking along bedding and joint planes.
- 10.0 Bottom of pit - dry hole.

TP 120. ELEV. 921.0, 7-80, 700' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 10.0 Clay gravel with sand and cobbles, red-brn with some yellow and black mottling Cl. moist, compact, trace of boulders, 10' cobbles (1/2 over 6"), cobbles and boulders, durable sandstone, 15' gravel, 10' sand, fines are plastic, coarse particles are sandstone and siltstone, cobbles occur in lenses within material.
- 10.0 Bottom of pit - dry hole.

TP 121. ELEV. 1016.6, 7-80, 300' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 2.0 Clay with sand, red-brn, slightly moist, trace of gravel, 15' sand, fines are plastic.
- 2.0 6.0 Siltstone, silt to very fine grained sand size particles, moderately durable particles, grn-gry, moist, excavates as gravel with small cobbles and sand containing some thin clay seams, can be barely scratched with fingernail.
- 6.0 Bottom of pit - dry hole.

TP 122. ELEV. 887.9, 11-80, 1100' U.S.

- 0.0 0.5 Forest litter.
- 0.5 5.5 Clay, gravel with sand, brn, slightly moist, 20% gravel, 15' sand, plastic, coarse particles are platy sandstone, moderately durable, small cobbles in material and some coal noted.
- 5.5 9.0 Clay, sand, red-brn, moist, trace of gravel, 10' fine sand, fines are coarse particles are nondurable.
- 9.0 Bottom of pit - dry hole.

TP 123. ELEV. 979.9, 7-80, 1100' U.S.

- 0.0 0.4 Taproot, roots, etc.
- 0.4 7.5 Clay, sandy; red-brn to 7.0', grn-gry below 7.0', moist, trace of 20' fine sand, fines are plastic, coarse particles are nondurable, fine are plastic, 15' below 5.5'.
- 7.5 Bottom of pit - dry hole.

TP 124. ELEV. 916.1, 7-80, 700' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 6.0 Clay, sand with gravel, red-brn to yellow, moist, average composition 25' fine to sand, gravel, 20' sand, fines are plastic, coarse particles are nondurable siltstone, coarse particles increase 2.0 to 4.0'.
- 6.0 7.5 Clay, sandy, dk. red-brn, wet below 6.5', trace of gravel, 20' sand, are plastic, coarse particles are nondurable, very slight seepage into
- 7.5 10.0 Siltstone, bedrock, brn to grn-gry, wet, 7.5 to 8.5' excavates as GC 15' plastic fines and 35' sand, from 8.5 to 10.0' material excavated as with 5 plastic fines. Coarse particles are nondurable, easily scratched and broken with fingernail.
- 10.0 Bottom of pit - wet hole. Hole appears dry, little or no seepage present.

TP 125. ELEV. 921.0, 7-80, 700' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 3.5 Gravel, clay with sand, brn, slightly moist, 20% gravel, 25% sand, 45' plastic fines, coarse particles are platy, moderate to nondurable. Coarse coal particles.
- 3.5 9.5 Clay, gravel with sand, red-brn, moist, 15' gravel, 20' sand, fines are plastic, coarse particles are nondurable, contain thin beds of sandstone with small cobbles size pieces. Sandstone is moderately durable.
- 9.5 Bottom of pit - dry hole.

TP 126. ELEV. 922.8, 11-80, 700' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 10.0 Sand, gravel, clay with cobbles, brn, wet below 3.4', moderate seepage into pit, trace of large boulders, 15' cobbles (1/2 over 6"), 25' gravel, 30' sand, 25' plastic fines, coarse particles are shale and sandstone, thin platy and in random orientation, particles are moderate to nondurable.
- 10.0 Bottom of pit - wet hole, pit collapsing.

TP 201. ELEV. 917.0, 9-10, 100' U.S.

- 0.0 0.5 Forest litter, roots, some cobbles.
- 0.5 6.0 Clay with gravel and sand, red-brn with some yellow and grey mottling, moist, 15' gravel, 10' sand, fines are plastic, coarse particles are siltstone, nondurable, easily scratched with fingernail, material is compact.
- 6.0 9.0 Siltstone, olive with some yellow and grey, moist, scratched with fingernail, moderately to moderately durable, readily breaks along bedding and cleavage planes to gravel and sand size particles.
- 9.0 Bottom of pit - dry hole.

TP 202. ELEV. 940.8, 9-10, 50' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 9.5 Clay with gravel and sand, red-brn with some yellow mottling to 7.0', red-brn from 7.0-7.5', moist, a few sandstone cobbles noted, 20' gravel, sand, fines are plastic, from 7.0-7.5' gravel decreases to 10%. Coarse particles are platy, nondurable shale with some sandstone, material is compact.
- 9.5 Bottom of pit - dry hole.

TP 203. ELEV. 925.7, 7-80, 60' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 5.5 Clay with sand and gravel, red-brn with some yellow and brn mottling, moist, 10' gravel, 10' sand, fines are plastic, coarse particles are nondurable siltstone, material is compact, a few small sandstone cobbles noted to 3.0', material graded into recognizable siltstone bedrock at 3.5'.
- 5.5 10.0 Siltstone, olive, moist, bedrock highly weathered and breaks readily into nondurable sand and gravel size pieces, from 5.5 to 8.5' siltstone breaks down to 30' material with about 20 plastic fines. From 8.0 to 10.0' material excavates as GP. bedrock breaks readily along thin bedding planes and cleavage planes. 30' material contains up to 10' sand and grades into it.
- 10.0 Bottom of pit - wet hole.

TP 204. ELEV. 958.7, 7-80, 450' U.S.

- 0.0 0.5 Forest litter, roots, etc.
- 0.5 9.5 Clay, gravel with sand, red-brn with some yellow, moist, average composition 15' gravel, 10' sand, fines are plastic, coarse particles are nondurable siltstone, thin bed of sandstone cobbles size pieces at 5.5'. Percent of coarse particles increase with depth of pit from a trace of gravel to 20' gravel 8.0-9.5'.
- 9.5 Bottom of pit - dry

SAMPLES

| No. | Type | From | To | Loc. |
|-----|------|------|-----|------|
| 1 | 1 | 0.5 | 1.5 | |
| 2 | 1 | 1.5 | 3.0 | |

SAMPLES

| No. | Type | Loc. |
|-----|------|------|
| 1 | 1 | 3.5 |

H. 205, ELEV. 841.8, 855, Centerline
 Logged by: R. L. Hirshey 7/2/66
 Drilling Equipment: Sargent & Lundy

| Hole Depth From To | Description of Materials | Soil Class | STANDARD PENETRATION | | | | SAMPLE | | | |
|-----------------------|---|---------------|----------------------|------|---------|-----------|-----------|-----------|-----------|-----------|
| | | | Blows Per Foot | Type | From To | Depth | From To | Depth | Weight | Moisture |
| 0.0 0.4 | Forest litter, roots, etc. | | 1-7-7 | Sp | 1 | 0.0 2.0 | 0.0 2.0 | 0.0 2.0 | 0.0 2.0 | 0.0 2.0 |
| 0.4 2.0 | Clay, sand, brn, moist, trace of cobbles, trace of gravel, 20 sand, fines are plastic, coarse particles are nondurable | CL | 11-16-16-13 | | 2 | 2.0 4.0 | 2.0 4.0 | 2.0 4.0 | 2.0 4.0 | 2.0 4.0 |
| | | | 12-11-11- | | 3 | 4.0 6.0 | 4.0 6.0 | 4.0 6.0 | 4.0 6.0 | 4.0 6.0 |
| | | | 12-7-11 | | 4 | 6.0 8.0 | 6.0 8.0 | 6.0 8.0 | 6.0 8.0 | 6.0 8.0 |
| | | | 12-1-1-1 | | 5 | 8.0 10.0 | 8.0 10.0 | 8.0 10.0 | 8.0 10.0 | 8.0 10.0 |
| 2.0 6.5 | Clay, sand with gravel, brn to red-brn, moist, 15 gravel, 25 sand, fines are plastic, contains approx. 10 small cobbles, coarse particles are nondurable | CL | 31-71 | Sp | 6 | 10.0 12.0 | 10.0 12.0 | 10.0 12.0 | 10.0 12.0 | 10.0 12.0 |
| | | | | Trl | | 12.0 14.0 | 12.0 14.0 | 12.0 14.0 | 12.0 14.0 | 12.0 14.0 |
| | | | | Trl | | 14.0 16.0 | 14.0 16.0 | 14.0 16.0 | 14.0 16.0 | 14.0 16.0 |
| 6.5 9.0 | Clay, sand with gravel, red-brn, moist, 20 gravel, 20 sand, fines are plastic, coarse particles are thin and platy and nondurable | CL | | | | 16.0 18.0 | 16.0 18.0 | 16.0 18.0 | 16.0 18.0 | 16.0 18.0 |
| | | | | | | 18.0 20.0 | 18.0 20.0 | 18.0 20.0 | 18.0 20.0 | 18.0 20.0 |
| 9.0 13.5 | Sand, clay with gravel, brn and red-brn below 10", 25 gravel, 15 sand, fines are plastic, contains from a trace to 10 cobbles | CL | | | | 20.0 22.0 | 20.0 22.0 | 20.0 22.0 | 20.0 22.0 | 20.0 22.0 |
| | | | | | | 22.0 24.0 | 22.0 24.0 | 22.0 24.0 | 22.0 24.0 | 22.0 24.0 |
| 13.5 26.0 | Clay, shale, red-gray to gray, thin bedded, cored pieces .05 to .1' long, core breaks readily along smooth horizontal bedding planes, core fit fairly well together with some broken "conch", some vertical fractures noted with some iron staining, very thin clay strata noted. Clay noted 0.1' thick at 25.0'. Core can be scratched with fingernail (core easily scratched from 24.5 to 25.1'). | | | | | 24.0 26.0 | 24.0 26.0 | 24.0 26.0 | 24.0 26.0 | 24.0 26.0 |
| 26.0 | Bottom of hole - wet hole | | | | | | | | | |

H. 206, ELEV. 846.3, 860, 78' S.E.
 Logged by: R. L. Hirshey 7/2/66
 Drilling Equipment: Sargent & Lundy

| Hole Depth From To | Description of Materials | Soil Class | STANDARD PENETRATION | | | | SAMPLE | | | |
|-----------------------|---|---------------|----------------------|------|---------|-----------|-----------|-----------|-----------|-----------|
| | | | Blows Per Foot | Type | From To | Depth | From To | Depth | Weight | Moisture |
| 0.0 0.5 | Forest litter, roots, etc. | | 4-6-6-6 | Sp | 1 | 0.0 2.0 | 0.0 2.0 | 0.0 2.0 | 0.0 2.0 | 0.0 2.0 |
| 0.5 2.0 | Clay, sand with gravel, brn, moist, 10 fine gravel, 20 sand, fines are plastic | CL | 11-18-18-18 | | 2 | 2.0 4.0 | 2.0 4.0 | 2.0 4.0 | 2.0 4.0 | 2.0 4.0 |
| | | | 8-8-10-11 | | 3 | 4.0 6.0 | 4.0 6.0 | 4.0 6.0 | 4.0 6.0 | 4.0 6.0 |
| | | | 10-11-10-21 | | 4 | 6.0 8.0 | 6.0 8.0 | 6.0 8.0 | 6.0 8.0 | 6.0 8.0 |
| 2.0 4.5 | Clay, gravel with sand, brn to red-brn, moist, 10 small cobbles, 15 gravel, 25 sand, fines are plastic, cobbles are moderately durable and gravel is nondurable shale | CL | 8-10-11-16 | | 5 | 8.0 10.0 | 8.0 10.0 | 8.0 10.0 | 8.0 10.0 | 8.0 10.0 |
| | | | 10-10-12-1 | | 6 | 10.0 12.0 | 10.0 12.0 | 10.0 12.0 | 10.0 12.0 | 10.0 12.0 |
| | | | 11-17-70 | Sp | 7 | 12.0 14.0 | 12.0 14.0 | 12.0 14.0 | 12.0 14.0 | 12.0 14.0 |
| | | | | Trl | | 14.0 16.0 | 14.0 16.0 | 14.0 16.0 | 14.0 16.0 | 14.0 16.0 |
| | | | | Trl | | 16.0 18.0 | 16.0 18.0 | 16.0 18.0 | 16.0 18.0 | 16.0 18.0 |
| 4.5 10.0 | Clay, sand with gravel, red-brn with some yellow and gray, appears to be laminated below 5.5', 15 gravel, 20 sand, fines are plastic, some strata of CL with trace of gravel and 15 sand, contains trace of cobbles, composition variable according to degree of weathering of different shale units | CL | | | | 18.0 20.0 | 18.0 20.0 | 18.0 20.0 | 18.0 20.0 | 18.0 20.0 |
| | | | | | | 20.0 22.0 | 20.0 22.0 | 20.0 22.0 | 20.0 22.0 | 20.0 22.0 |
| | | | | | | 22.0 24.0 | 22.0 24.0 | 22.0 24.0 | 22.0 24.0 | 22.0 24.0 |
| 10.0 15.1 | Clay, sand with gravel, brn, CL to yellow-brn, moist, 10 gravel, 25 sand, fines are plastic, coarse particles are nondurable shale | | | | | 24.0 26.0 | 24.0 26.0 | 24.0 26.0 | 24.0 26.0 | 24.0 26.0 |
| 15.1 22.0 | Shale-clayey, red-brn to 25.1' and sand, gray to 32.0', easily scratched with fingernail, easily broken along smooth flat bedding planes, contains vertical fractures. Two pronounced planes of weakness, bedding planes and vertical fractures. Shale is thin bedded, beds 0.03' thick, cored pieces up to 0.2' long. Core highly broken to 20.0' with numerous gravel in pieces, some broken and noted to bottom of hole. Some iron staining noted. Contains some thin clay strata. | | | | | 26.0 28.0 | 26.0 28.0 | 26.0 28.0 | 26.0 28.0 | 26.0 28.0 |
| 22.0 | Bottom of hole - wet hole | | | | | | | | | |

H. 206, ELEV. 846.3, 860, 80' S.E.

| Hole Depth From To | Description of Materials | Soil Class | Type | From To | |
|-----------------------|---------------------------|---------------|------|-----------|--------|
| | | | | Depth | Weight |
| 0.0 8.0 | Earth boring | | Sp | 0.0 8.0 | 0 |
| 8.0 10.5 | Discarded | | D | 8.0 10.5 | 100 |
| 10.5 13.0 | Discarded | | D | 10.5 13.0 | 100 |
| 13.0 | Bottom of hole - dry hole | | | | |

See note, str. 21

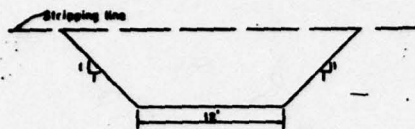
Unified classification by laboratory analysis

| | |
|---|----------------------|
| HARMON CREEK WATERSHED FLOODWATER RETARDING DAM PA-479 WASHINGTON COUNTY, PENNSYLVANIA LOGS OF DRILL HOLES AND TEST PITS | |
| U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | |
| Date 1-67 | Approved by _____ |
| Prepared by R. Hirshey | Title _____ |
| Project _____ | Station _____ |
| Date 1-19 | Date 1-21 |
| PA-479-P | |

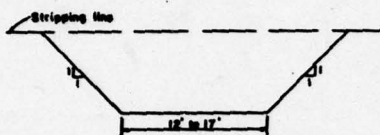
PLATE 7

D'APPOLONIA

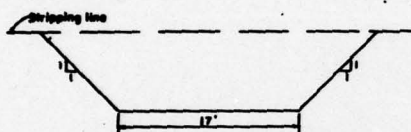
| | | | | | |
|-------------|--------|-------------------|-----|-------------------|-------------|
| DRAWN BY | 1-4-79 | CHECKED BY ACS | BE | DRAWING NUMBER | 78-367-B 59 |
| | 3/1/79 | | JHD | | 3.1.79 |



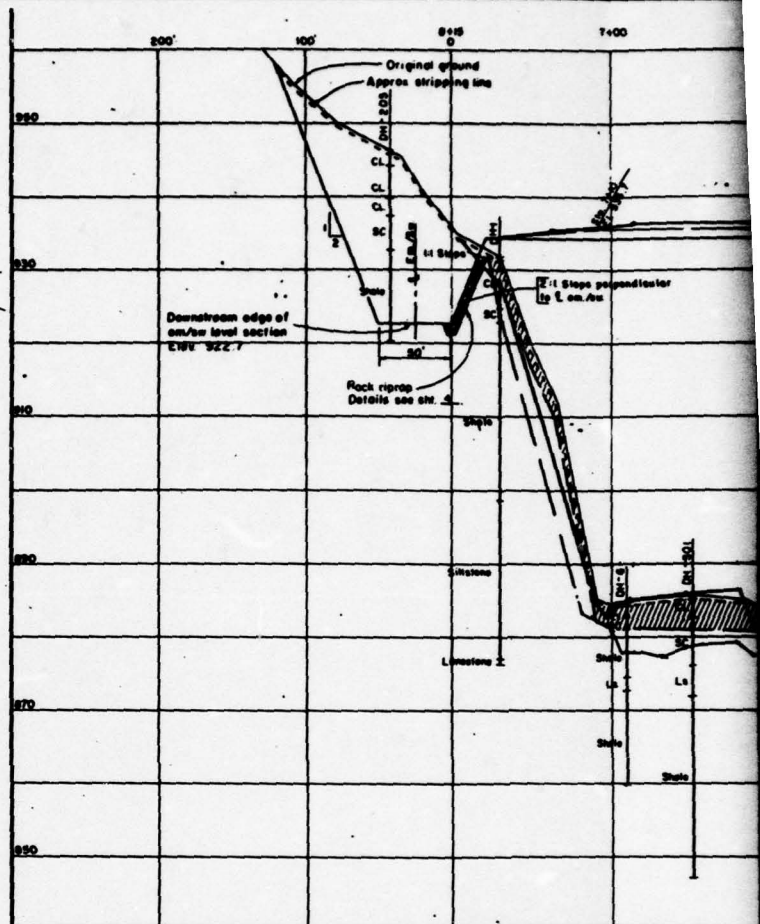
TYPICAL BETWEEN & DAM STATIONS
1+46 TO 2+80 & 7+22 TO 7+88



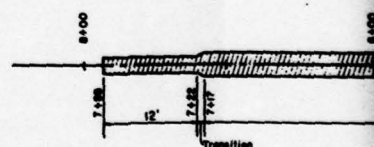
TRANSITION SECTION
TYPICAL BETWEEN & DAM STATIONS
2+80 TO 2+85 & 7+17 TO 7+22

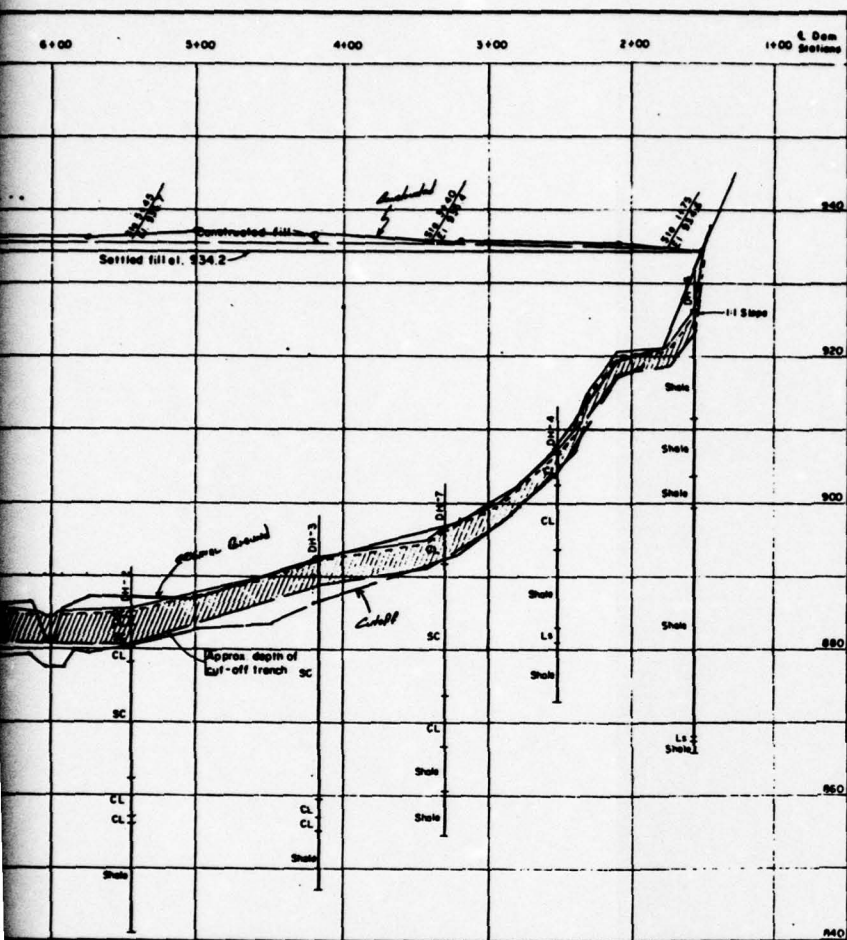


TYPICAL BETWEEN & DAM STATIONS
2+85 TO 7+17

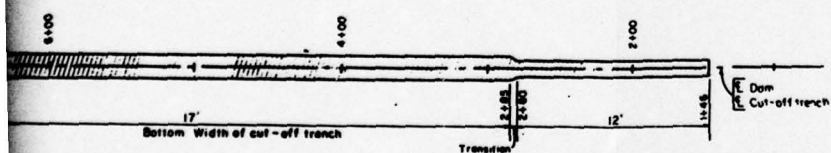


PROFILE ALONG & CUT-OFF TRENCH





TRENCH AND DOWNSTREAM EDGE OF LEVEL SECTION



PLAN VIEW
0 25 50 100
SCALE IN FEET

CONSTRUCTION NOTES

1. For logs of test holes see sheets 12, 19, 20.
2. E. Dam - E. Cut-off trench

AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-479
WASHINGTON COUNTY, PENNSYLVANIA
CUT-OFF TRENCH DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Drawn by *Donald R. Hilly* 11-67
Checked by *C. CRISE* 11-67
Date *12-1-67*

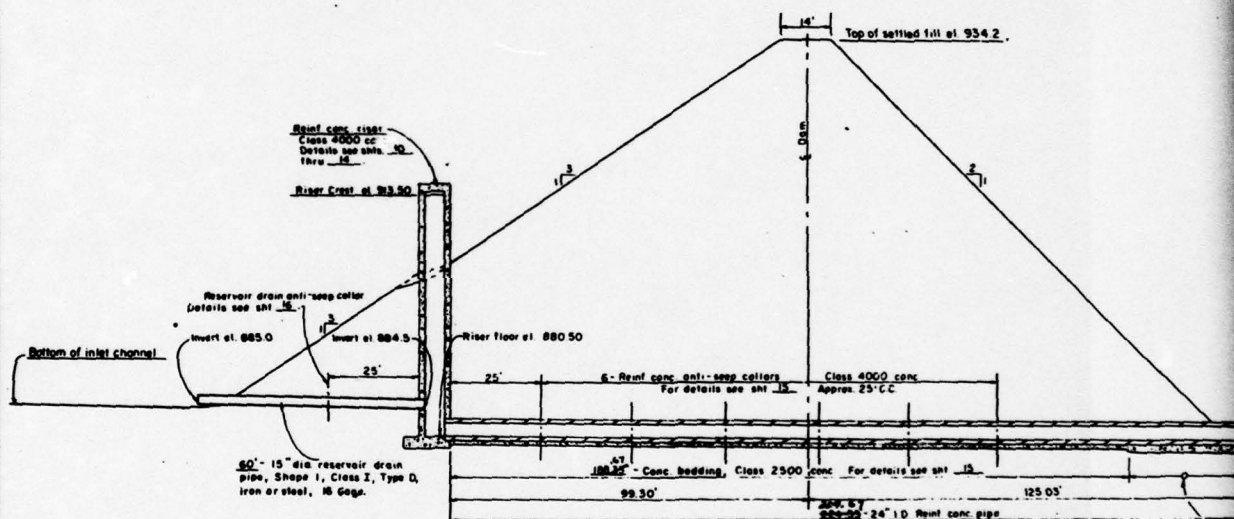
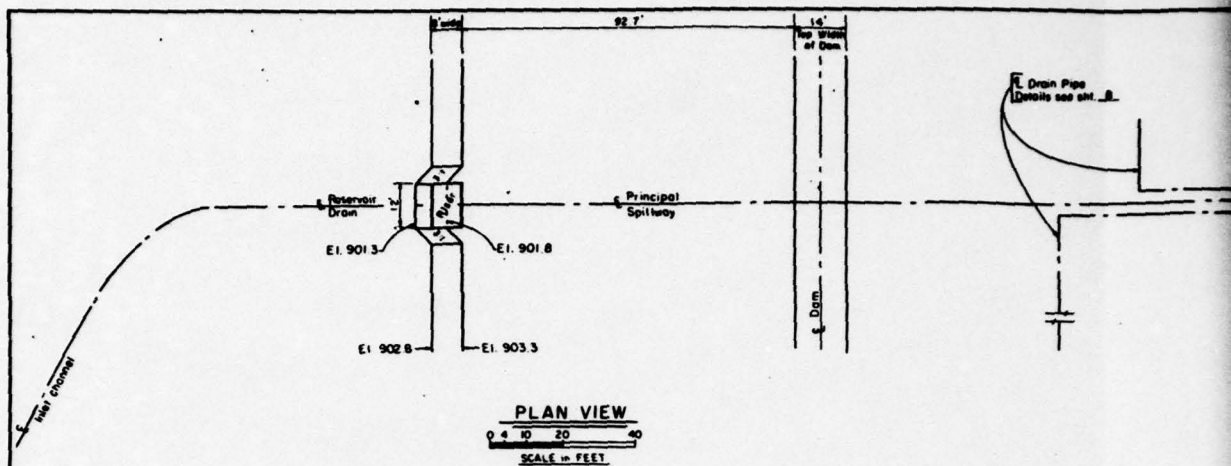
PA-479-P

PLATE 8

D'APPOLONIA

2

DRAWN BY ACS CHECKED BY BE 3/1/79 DRAWING 78-367-B60
 1-4-79 APPROVED BY JMS 3.1.79 NUMBER



AS BUILT
 24" ID PIPE JOINT DATA

| JOINT | DIST FROM RISER WALL | INVERT EL |
|-------|----------------------|-----------|
| A | 0 | 880.50 |
| B | 20.03 | 880.38 |
| C | 40.06 | 880.27 |
| D | 60.09 | 880.18 |
| E | 80.12 | 880.03 |
| F | 100.15 | 879.92 |
| G | 120.18 | 879.85 |
| H | 140.21 | 879.76 |
| I | 160.26 | 879.66 |
| J | 180.27 | 879.55 |
| K | 200.30 | 879.43 |
| L | 220.33 | 879.32 |
| M | 240.67 | 879.20 |

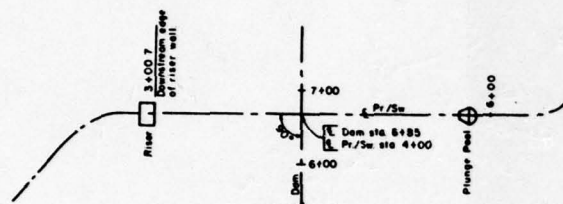
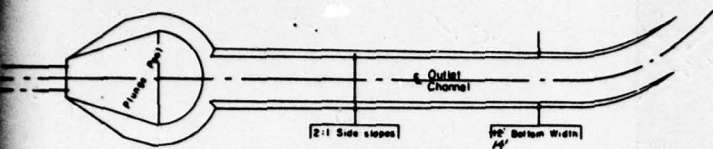
AS BUILT
 COLLAR DATA FOR 24" ID PIPE

| COLLAR | DIST FROM RISER WALL | INVERT EL |
|--------|----------------------|-----------|
| 1 | 26.5 | 880.36 |
| 2 | 48.0 | 880.23 |
| 3 | 71.8 | 880.09 |
| 4 | 94.9 | 879.96 |
| 5 | 118.4 | 879.81 |
| 6 | 141.4 | 879.68 |

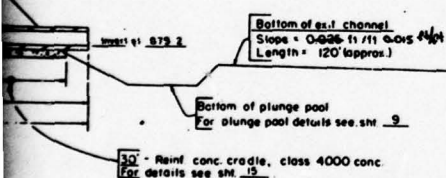
24" ID Reinforced concrete pressure pipe spillway conduit.

224' - Straight sections
 1 - Spigot ring wall fitting (for 15' wall)
 Maximum Pressure Head = 43'. Minimum Pressure Head = 0
 Load = 48,120 lbs per lin ft, based on O.D. of 2.67'
 Min. 3 edge bearing strength for:
 O.D. Crack non-prestressed pipe = 25,200 lbs per lin ft
 O.D. Crack prestressed pipe = 18,950 lbs per lin ft
 224.33' Total

CONSTRUCTION
 1. Outlet end of pipe to no metal is exposed.
 2. Pipe layout data will the engineer



LAYOUT OF PRINCIPAL SPILLWAY
NOT TO SCALE



AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA - 479
WASHINGTON COUNTY, PENNSYLVANIA

PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

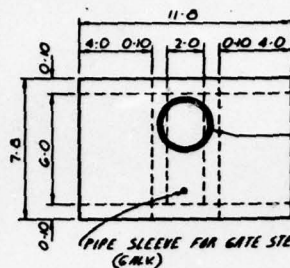
Charles E. Kelly 10-57
C. CRISE 10-57

Langdon B. Smith 12-62 5 PA-479-P

PLATE 9

D'APPOLONIA

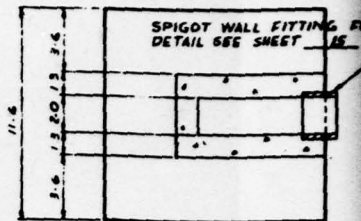
DRAWN BY ACS CHECKED BY BE 3/1/79 DRAWING NUMBER 78-367-B61
 1-4-79 APPROVED BY JHP 3.1.79



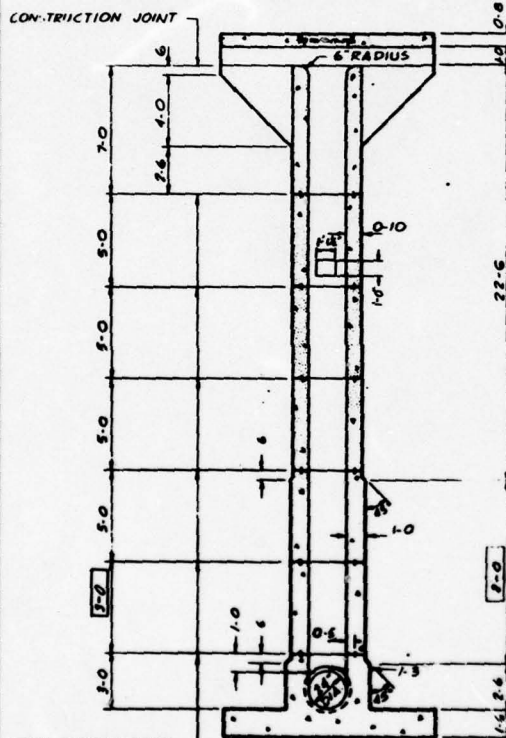
TOP PLAN

WALNUT FRAME FOR DETAIL SEE SHEET 16

FOR DETAIL OF TRASH RACK ANGLES AND GRATING SEE SHEET 16



SECTION A-A



SECTION B-B

PLATE CONSTRUCTION JOINT. SEE DETAIL THIS SHEET

1/4" x 6" Steel Plate Continuous Thru Constr Joint. Splices Shall Be Either:
 1. Butt Welded
 2. Lapped 3" And Bolted
 3. Lapped 3" And Fillet Welded

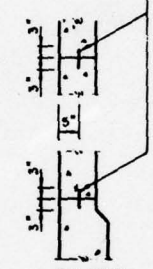
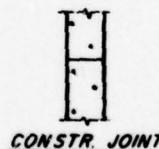
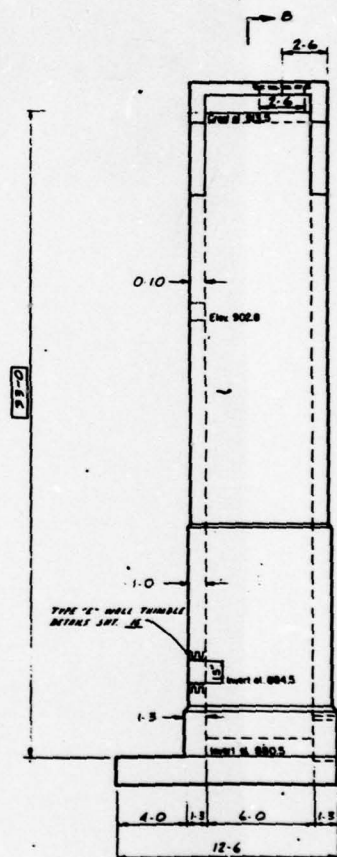


PLATE CONSTR. JOINT



CONSTR. JOINT



SIDEWALL ELEVATION

0 2 4 6
 SCALE IN FEET

NOTE: For Construction Details see sheet 16

| STEEL SCHEDULE | | | | | | | | | | | | | | | | | | | |
|----------------|------|----------|--------|------|------|------|--------------|------|------|----------|--------|------|---|---|--------------|------|------|----------|--------|
| MARK | SIZE | QUANTITY | LENGTH | TYPE | B | C | TOTAL LENGTH | MARK | SIZE | QUANTITY | LENGTH | TYPE | B | C | TOTAL LENGTH | MARK | SIZE | QUANTITY | LENGTH |
| B1 | 5 | 12 | 11.0 | | | | 132.0 | | | | | | | | | | | | |
| B2 | 6 | 5 | 11.0 | | | | 55.0 | | | | | | | | | | | | |
| B3 | 6 | 12 | 12.0 | | | | 144.0 | | | | | | | | | | | | |
| B4 | 7 | 11 | 7.3 | | | | 74.1 | | | | | | | | | | | | |
| B5 | 6 | 24 | 6.7 | 21 | 3-0 | 3-7 | 158.0 | | | | | | | | | | | | |
| B6 | 6 | 12 | 12.0 | | | | 144.0 | | | | | | | | | | | | |
| B7 | 6 | 18 | 11.0 | | | | 165.0 | | | | | | | | | | | | |
| B8 | 6 | 2 | 4.4 | | | | 4.6 | | | | | | | | | | | | |
| B9 | 5 | 5 | 4.6 | 21 | 1-0 | 3-6 | 22.6 | | | | | | | | | | | | |
| B10 | 5 | 3 | 6.7 | 21 | 1-0 | 5-7 | 19.9 | | | | | | | | | | | | |
| B11 | 5 | 16 | 6.7 | 21 | 1-0 | 5-7 | 105.4 | | | | | | | | | | | | |
| B12 | 5 | 2 | 4.6 | 21 | 1-0 | 3-6 | 9.0 | | | | | | | | | | | | |
| B13 | 5 | 8 | 4.8 | | | | 53.4 | | | | | | | | | | | | |
| B14 | 5 | 4 | 3.0 | | | | 12.0 | | | | | | | | | | | | |
| B15 | 5 | 10 | 7.10 | 21 | 2-11 | 4-11 | 78.4 | | | | | | | | | | | | |
| B16 | 5 | 4 | 5.9 | 21 | 0-10 | 4-11 | 23.0 | | | | | | | | | | | | |
| B17 | 5 | 4 | 5.7 | 21 | 0-8 | 4-11 | 22.4 | | | | | | | | | | | | |
| B18 | 5 | 2 | 6.5 | 21 | 1-6 | 4-11 | 12.10 | | | | | | | | | | | | |
| B19 | 6 | 4 | 1.4 | 21 | 2-10 | 4-10 | 30.8 | | | | | | | | | | | | |
| B20 | 6 | 24 | 4.0 | | | | 96.0 | | | | | | | | | | | | |
| B21 | 5 | 5 | 3.8 | | | | 18.4 | | | | | | | | | | | | |
| B22 | 5 | 2 | 5.8 | | | | 7.4 | | | | | | | | | | | | |
| B23 | 5 | 2 | 2.5 | | | | 4.10 | | | | | | | | | | | | |
| B24 | 5 | 2 | 2.7 | | | | 5.2 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| R1 | 5 | 12 | 7.7 | | | | 115.0 | | | | | | | | | | | | |
| R2 | 5 | 4 | 9.7 | | | | 38.6 | | | | | | | | | | | | |
| R3 | 5 | 16 | 7.6 | | | | 120.0 | | | | | | | | | | | | |
| R4 | 5 | 8 | 7.4 | | | | 60.0 | | | | | | | | | | | | |
| R5 | 5 | 12 | 4.8 | | | | 60.0 | | | | | | | | | | | | |
| R6 | 5 | 6 | 2.8 | | | | 16.0 | | | | | | | | | | | | |
| R7 | 6 | 24 | 7.8 | 21 | 2-10 | 4-10 | 236.0 | | | | | | | | | | | | |
| R8 | 5 | 16 | 6.8 | | | | 106.8 | | | | | | | | | | | | |
| R9 | 5 | 10 | 2.8 | | | | 26.8 | | | | | | | | | | | | |
| R10 | 5 | 36 | 7.4 | 21 | 2-8 | 4-8 | 264.0 | | | | | | | | | | | | |
| R11 | 5 | 16 | 3.8 | | | | 58.8 | | | | | | | | | | | | |
| R12 | 5 | 8 | 3.8 | | | | 29.4 | | | | | | | | | | | | |
| R13 | 5 | 4 | 7.0 | 21 | 2-6 | 4-6 | 28.0 | | | | | | | | | | | | |
| R14 | 5 | 10 | 11.7 | | | | 115.0 | | | | | | | | | | | | |
| R15 | 5 | 4 | 11.7 | | | | 46.4 | | | | | | | | | | | | |
| R16 | 5 | 12 | 11.7 | | | | 139.0 | | | | | | | | | | | | |
| R17 | 5 | 6 | 11.7 | | | | 69.6 | | | | | | | | | | | | |
| R18 | 5 | 16 | 6.8 | | | | 106.8 | | | | | | | | | | | | |
| R19 | 5 | 8 | 2.8 | | | | 21.4 | | | | | | | | | | | | |
| R20 | 5 | 40 | 7.0 | 21 | 2-6 | 4-6 | 280.0 | | | | | | | | | | | | |
| R21 | 5 | 10 | 6.8 | | | | 66.8 | | | | | | | | | | | | |
| R22 | 5 | 8 | 2.8 | | | | 21.4 | | | | | | | | | | | | |
| R23 | 5 | 32 | 7.0 | 21 | 2-6 | 4-6 | 224.0 | | | | | | | | | | | | |
| R24 | 5 | 10 | 6.7 | | | | 65.10 | | | | | | | | | | | | |
| R25 | 5 | 4 | 6.7 | | | | 26.4 | | | | | | | | | | | | |
| R26 | 5 | 12 | 6.7 | | | | 79.0 | | | | | | | | | | | | |
| R27 | 5 | 6 | 6.7 | | | | 39.6 | | | | | | | | | | | | |
| R28 | 5 | 8 | 6.8 | | | | 53.4 | | | | | | | | | | | | |
| R29 | 5 | 8 | 2.8 | | | | 21.4 | | | | | | | | | | | | |
| R30 | 5 | 20 | 7.0 | 21 | 2-6 | 4-6 | 140.0 | | | | | | | | | | | | |
| R31 | 5 | 8 | 1.10 | | | | 14.8 | | | | | | | | | | | | |
| R32 | 5 | 8 | 2.4 | | | | 18.8 | | | | | | | | | | | | |

QUANTITIES

4 BARS 254.4 170 LBS.
 5 BARS 594.5 411.4 LBS.
 6 BARS 198.2 138.3 LBS.
 7 BARS 79.9 163 LBS.
 34.5 CU. YDS.

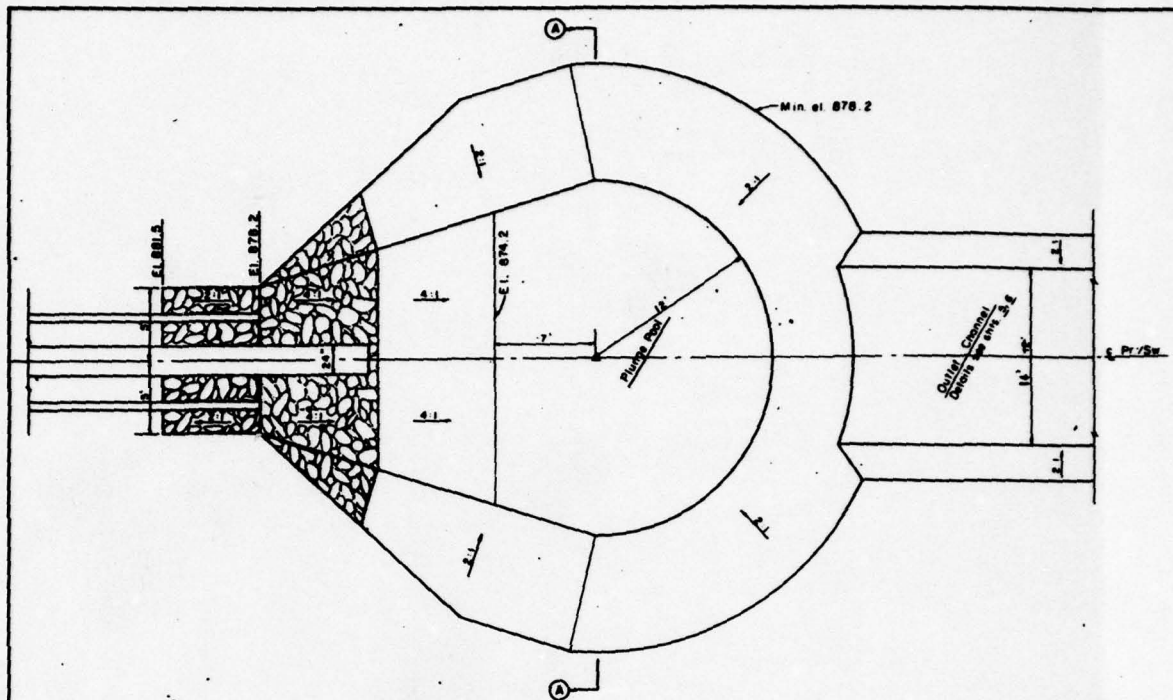
AS BUILT

| | |
|--|----------------------------|
| HARMON CREEK WATERSHED FLOODWATER RETARDING DAM PA-479 WASHINGTON COUNTY, PENNSYLVANIA RISER STRUCTURAL DETAILS | |
| U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | |
| Date 10/1/62 | Approved By [Signature] |
| Drawn By [Signature] | Checked By [Signature] |
| Scale 1" = 10'-0" | Project No. PA-479-3 |

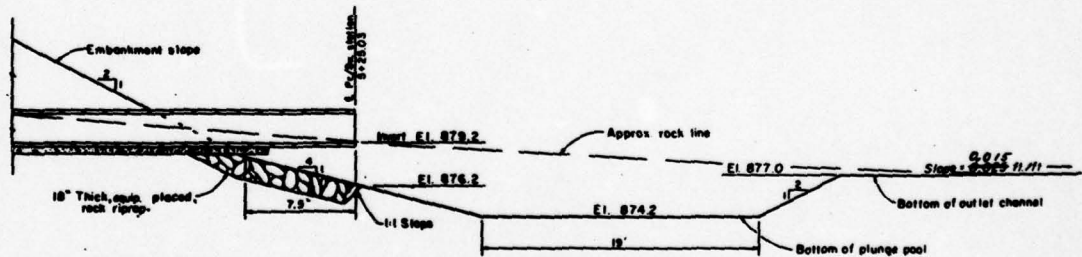
PLATE 10

D'APPOLONIA

| | | | | | |
|----------|--------|-------------|--------|----------------|------------|
| DRAWN BY | ACS | CHECKED BY | 3/1/79 | DRAWING NUMBER | 78-367-B62 |
| BY | 1-4-79 | APPROVED BY | JHP | | |

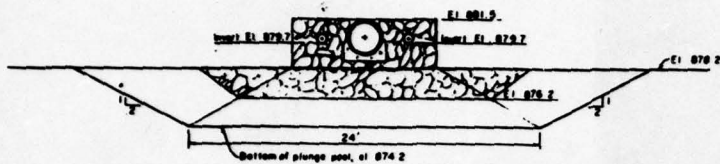


PLAN VIEW



PROFILE ALONG PLUNGE POOL

- CONSTRUCTION NOTES**
1. Minimum top of plunge pool = el. 878.2. Fill with zone I material as required to obtain min. elevation.
 2. Grade area in vicinity of plunge pool and exit channel to obtain free drainage.



SECTION A-A

AS BUILT



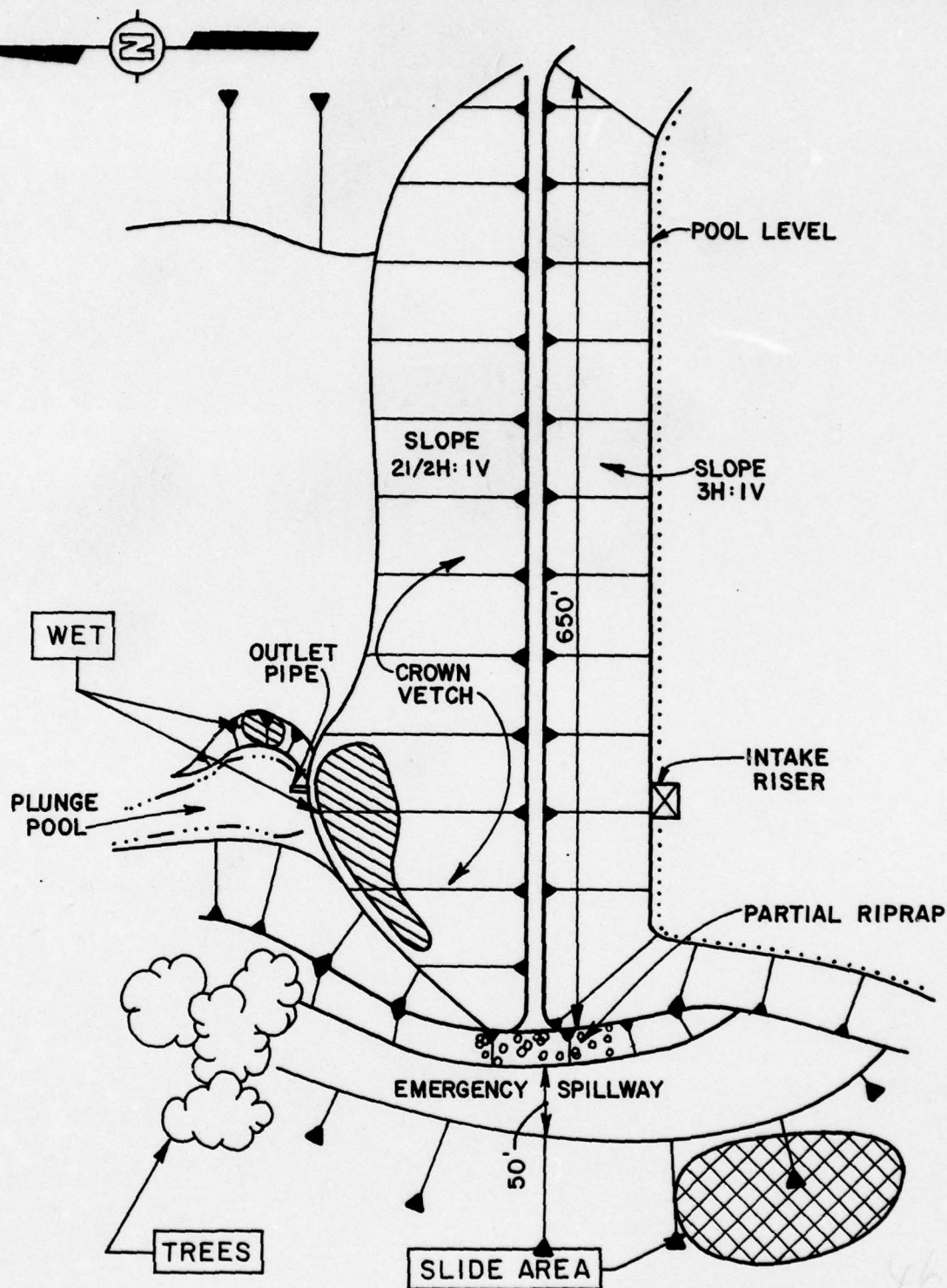
| | |
|-----------------------------------|-------|
| HARMON CREEK WATERSHED | |
| FLOODWATER RETARDING DAM PA - 479 | |
| WASHINGTON COUNTY, PENNSYLVANIA | |
| PLUNGE POOL DETAILS | |
| U. S. DEPARTMENT OF AGRICULTURE | |
| SOIL CONSERVATION SERVICE | |
| <i>Donald R. Shady</i> | 11-57 |
| C. CRIZE | 11-57 |
| PA-479-P | |

PLATE II

D'APPOLONIA

2

| | | | | | |
|-------------|---------------|-------------|--------|-------------------|-----------|
| DRAWN BY | MBM 1-3-79 | CHECKED BY | 3/1/79 | DRAWING NUMBER | 78-367-AB |
| | | APPROVED BY | JHP | | |



NOTES:

1. EMERGENCY SPILLWAY
FREEBOARD: 5.1 FT.
2. POOL LEVEL DATE OF
INSPECTION: 30.3 FT. BELOW
CREST OF DAM

PLATE 12

PA.479 DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: DEC. 5, 1978

D'APPOLONIA

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM PA-479 COUNTY Washington STATE Pennsylvania ID# NDI I.D. NO. PA-509
TYPE OF DAM Earth HAZARD CATEGORY High DER I.D. NO. 63-71

DATE(S) INSPECTION December 5, 1978 WEATHER Sunny TEMPERATURE 40s

POOL ELEVATION AT TIME OF INSPECTION 903.8 M.S.L. TAILWATER AT TIME OF INSPECTION 876.5 M.S.L.

INSPECTION PERSONNEL:

REVIEW INSPECTION PERSONNEL:
(December 21, 1978)

| | |
|--------------|----------------|
| Bilgin Erel | L. D. Andersen |
| Wah-Tak Chan | J. H. Poellot |
| | Bilgin Erel |

Bilgin Erel RECORDER

VISUAL INSPECTION
PHASE 1
EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--|--|--|
| SURFACE CRACKS | None. | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None. | |
| SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | None. | |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Crest elevation is within 1/2 foot of the as-built crest elevation relative to the spillway crest elevation. | The irregularities appeared to be from truck tracks. |
| RIPRAP FAILURES | No riprap on the dam. | |

VISUAL INSPECTION
PHASE I
EMBANKMENT

| VISUAL EXAMINATION OF JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--|--|--|
| | No signs of distress. | |
| ANY NOTICEABLE SEEPAGE | One wet area on the downstream slope near the left abutment above the outlet works. | The wet area should be periodically observed to document if a seepage condition is developing. |
| STAFF GAGE AND RECORDER | None. | |
| DRAINS | Drainage blanket drainpipes are located adjacent to the outlet pipe. There is no flow in the drainpipes. | |
| | | |

VISUAL INSPECTION
PHASE I
OUTLET WORKS

| VISUAL EXAMINATION OF CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| | The visible portions of the outlet works are in good condition. | |
| INTAKE STRUCTURE | In good condition. | |
| OUTLET STRUCTURE | Minor scour in the plunge pool beneath the outlet pipe. | Maintenance should be performed if scour conditions worsen. |
| OUTLET CHANNEL | No significant obstructions. | |
| EMERGENCY GATE | Reservoir drainpipe gate hoist is located on the drop inlet structure. Not accessible for inspection. | The operational condition of the reservoir drainpipe gate should be periodically evaluated. |

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-----------------------|---|--|
| CONCRETE WEIR | There is no concrete overflow structure in the emergency spillway. | |
| APPROACH CHANNEL | Trapezoidal earth channel. The slope adjacent to the emergency spillway is wet and irregular, indicating potential slope instability. | The slopes adjacent to the emergency spillway should be stabilized to prevent development of a slide which would block the spillway. |
| DISCHARGE CHANNEL | Trapezoidal earth channel (see remarks above). | See remarks above. |
| BRIDGE AND PIERS | None. | |
| | | |

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-------------------------------|--------------|----------------------------|
| CONCRETE SILL | N/A. | |
| APPROACH CHANNEL | N/A. | |
| DISCHARGE CHANNEL | N/A. | |
| BRIDGE PIERS | N/A. | |
| GATES AND OPERATION EQUIPMENT | N/A. | |

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|-----------------------|---|----------------------------|
| MONUMENTATION/SURVEYS | None found. | |
| OBSERVATION WELLS | None. | |
| WEIRS | None. | |
| PIEZOMETERS | None. | |
| OTHER | Toe drainpipes discharging into the plunge pool. No flow in the drainpipes. | |

VISUAL INSPECTION
PHASE I
RESERVOIR
OBSERVATIONS

| VISUAL EXAMINATION OF | REMARKS OR RECOMMENDATIONS |
|-----------------------|----------------------------|
| SLOPES | Steep to moderate. |
| SEDIMENTATION | Unknown. |
| UPSTREAM RESERVOIRS | None. |
| | |
| | |

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--|--|----------------------------|
| CONDITION (OBSTRUCTIONS, DEBRIS, ETC.) | No apparent obstructions immediately downstream from the dam. | |
| SLOPES | No apparent instability (immediately downstream from the dam). | |
| APPROXIMATE NUMBER OF HOMES AND POPULATION | There are three homes approximately one mile downstream and 20 homes approximately two miles downstream. Population: Approximately 125 (initial impact area). | |
| | | |
| | | |

APPENDIX B
CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
AND HYDROLOGIC AND HYDRAULIC
PHASE I

APPENDIX B
CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM PA-479
ID# NDI I.D. NO. PA-509
DER I.D. NO. 63-71

| ITEM | REMARKS |
|---|---|
| AS-BUILT DRAWINGS | The drawings are available in state and Soil Conservation Service files. |
| REGIONAL VICINITY MAP | See Plate 1. |
| CONSTRUCTION HISTORY | The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service. It was constructed by Windy Hill Construction Company of Burgettstown, Pennsylvania, with completion in July 1969. |
| TYPICAL SECTIONS OF DAM | See Plate 3. |
| OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS | See Plates 9, 10, and 11. |

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

| ITEM | REMARKS |
|---|---|
| RAINFALL/RESERVOIR RECORDS | Not available. |
| DESIGN REPORTS | Soil Conservation Service internal memo dated April 3, 1967. |
| GEOLOGY REPORTS | Detailed Geologic Investigation of Dam Sites, SCS Form 376 (undated). |
| DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES | Hydrology, hydraulics, geotechnical, and structural calculations are available in SCS files. |
| MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD | Included in design and geology reports (see Plate 8 for typical subsurface profile and Plates 5, 6, and 7 for boring logs). |

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

| ITEM | REMARKS |
|----------------------------------|---------------------------------|
| POST CONSTRUCTION SURVEYS OF DAM | None reported. |
| BORROW SOURCES | Described in engineer's report. |
| MONITORING SYSTEMS | None. |
| MODIFICATIONS | None reported. |
| HIGH POOL RECORDS | Not recorded. |

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

| ITEM | REMARKS |
|---|---|
| POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS | An SCS report entitled, <u>Harmon Creek, PA-479 Slide</u> , dated April 2, 1971. |
| PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS | Landslides on the slope adjacent to the emergency spillway (see Section 2.2 of the report). |
| MAINTENANCE OPERATION RECORDS | Not available. |
| SPILLWAY PLAN SECTIONS DETAILS | Primary spillway: See Plates 9, 10, and 11. Emergency spillway: See Plates 2 and 3. |
| OPERATING EQUIPMENT PLANS AND DETAILS | Available in SCS files. |

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 1.15 square miles (reclaimed strip mines)
ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 902.8 (5⁺ acre-feet)
ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: 922.7 (166 acre-feet)
ELEVATION; MAXIMUM DESIGN POOL: 934.2
ELEVATION; TOP DAM: 935.7 (top of overfill)
SPILLWAY: (Emergency Spillway)

- a. Elevation 922.7
- b. Type Trapezoidal open channel (critical depth overflow section)
- c. Width 50 feet (base width perpendicular to flow direction)
- d. Length 250⁺ feet (from crest to the end of the trapezoidal section)
- e. Location Spillover Adjacent to emergency spillway
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 24-inch reinforced concrete conduit
- b. Location Near left abutment
- c. Entrance Inverts El. 880.5
- d. Exit Inverts El. 879.2
- e. Emergency Draindown Facilities 15-inch reservoir drainpipe

HYDROMETEOROLOGICAL GAGES:

- a. Type None
- b. Location None
- c. Records None

MAXIMUM NONDAMAGING DISCHARGE: Emergency spillway discharge capacity (80,000⁺ cfs)

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
PA-479 DAM
NDI I.D. NO. PA-509
DECEMBER 5, 1978

PHOTOGRAPH NO.

DESCRIPTION

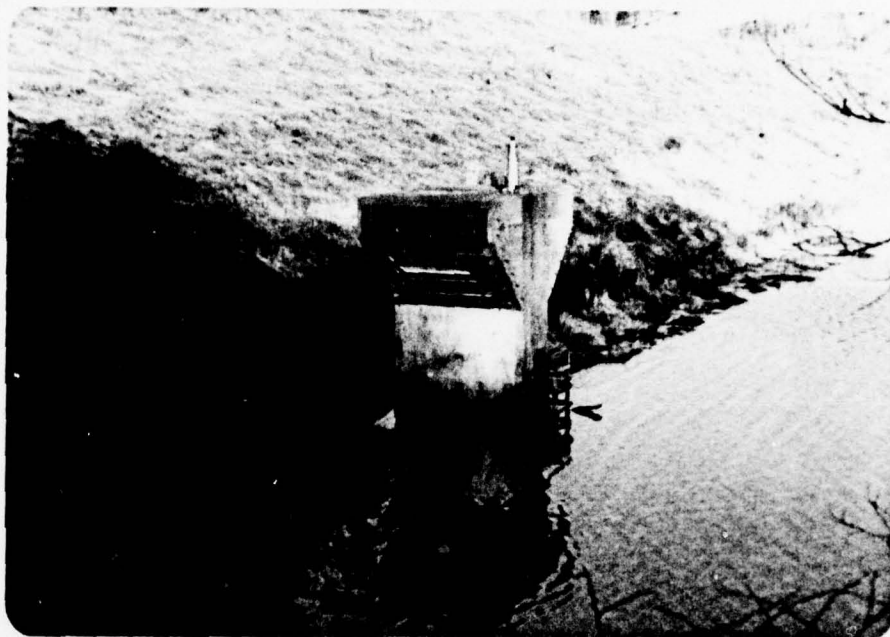
- | | |
|---|--|
| 1 | Emergency spillway approach channel. |
| 2 | Emergency spillway discharge channel. |
| 3 | Primary spillway drop inlet structure. |
| 4 | Outlet pipe. |



Photograph No. 1
Emergency spillway approach channel.



Photograph No. 2
Emergency spillway discharge channel.



Photograph No. 3
Primary spillway drop inlet structure.



Photograph No. 4
Outlet pipe.

APPENDIX D
CALCULATIONS

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: PA-479 (NDI I.D. PA-469)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.2 INCHES/24 HOURS ⁽¹⁾

| STATION | 1 | 2 | 3 | 4 | 5 |
|--|-----------|------|---|---|---|
| Station Description | Reservoir | Dam | | | |
| Drainage Area (square miles) | 1.15 | 0 | | | |
| Cumulative Drainage Area (square miles) | 1.15 | 1.15 | | | |
| Adjustment of PMF for Drainage Area (%) ⁽²⁾ | | | | | |
| 6 Hours | 102 | - | | | |
| 12 Hours | 120 | - | | | |
| 24 Hours | 130 | - | | | |
| 48 Hours | 140 | - | | | |
| 72 Hours | - | - | | | |
| Snyder Hydrograph Parameters | | | | | |
| Zone ⁽³⁾ | 28B | - | | | |
| C_p/C_t ⁽⁴⁾ | 0.57/1.7 | - | | | |
| L (miles) ⁽⁵⁾ | 1.3 | - | | | |
| L_{ca} (miles) ⁽⁵⁾ | 0.6 | - | | | |
| $t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours) | 1.6 | - | | | |
| Spillway Data | | | | | |
| Crest Length (ft) | - | 50 | | | |
| Freeboard (ft) | - | 11.5 | | | |
| Discharge Coefficient | - | 3.1 | | | |
| Exponent | - | 1.5 | | | |

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

(4) Snyder's Coefficients.

(5) L = Length of longest water course from outlet to basin divide.

L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

.....
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 11 JAN 79

| | | | | | | | | | | | |
|----|----|--|-------|-------|------|------|------|------|------|----|-------|
| 1 | A1 | SNYDER UNIT HYDROGRAPH, FLOOD ROUTING DAM OVERTOPPING ANALYSES | | | | | | | | | |
| 2 | A2 | PA.479 DAM, WASHINGTON COUNTY, NDI-ID.PA469 PROJECT NO 78-367-08 | | | | | | | | | |
| 3 | A3 | FOR 10%, 60%, 50%, 60%, 70%, 80%, 90%, AND 100% PMF | | | | | | | | | |
| 4 | B1 | 500 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | -4 | 0 |
| 5 | B2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | J1 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 | | |
| 7 | J2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | |
| 8 | K1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| 9 | K2 | CALCULATION OF INFLOW HYDROGRAPH TO PA.479 DAM, NDI-ID.PA469 | | | | | | | | | |
| 10 | M1 | 1 | 1 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1 | |
| 11 | P1 | 24.2 | 102 | 120 | 120 | 130 | 140 | 1.0 | .05 | | |
| 12 | T1 | 1.6 | 0.57 | | | | | | | | 0.003 |
| 13 | W1 | -1.0 | -0.05 | 2.0 | | | | | | | |
| 14 | Y1 | 1 | 2 | | | | | | | | |
| 15 | K3 | ROUTING FLOW THROUGH PA.479 DAME NDI-ID.PA469 | | | | | | | | | |
| 16 | V1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 17 | V2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| 18 | V3 | 26.4 | 200.0 | 420.0 | | | | | | | |
| 19 | V4 | 26.4 | 200.0 | 420.0 | | | | | | | |
| 20 | V5 | 924.0 | 924.0 | 935.0 | | | | | | | |
| 21 | V6 | 924.0 | 924.0 | 935.0 | | | | | | | |
| 22 | V7 | 934.2 | 934.2 | 935.0 | | | | | | | |
| 23 | V8 | 934.2 | 934.2 | 935.0 | | | | | | | |

COMPUTER INPUT OVERTOPPING ANALYSIS

PAGE D2 of 4

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

| OPERATION | STATION | AREA | PLAN | RATIOS APPLIED TO FLOWS | | | | | | | |
|---------------|---------|-------|------|-------------------------|---------|---------|---------|---------|---------|---------|---------|
| | | | | RATIO 1 | RATIO 2 | RATIO 3 | RATIO 4 | RATIO 5 | RATIO 6 | RATIO 7 | RATIO 8 |
| | | | | .30 | .40 | .50 | .60 | .70 | .80 | .90 | 1.00 |
| HYDROGRAPH AT | 1 | 1.15 | 1 | 924. | 1234. | 1541. | 1849. | 2157. | 2465. | 2773. | 3081. |
| | (| 2.09) | (| 26.78) | 34.90) | 43.63) | 52.35) | 61.08) | 69.80) | 78.53) | 87.25) |
| ROUTED TO | 2 | 1.15 | 1 | 801. | 1127. | 1435. | 1736. | 2036. | 2335. | 2636. | 2935. |
| | (| 2.09) | (| 22.68) | 31.97) | 41.64) | 49.16) | 57.64) | 66.12) | 74.59) | 83.11) |

PLAN 1

| | ELEVATION STORAGE | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM | RATIO OF PMF | MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|-------|----------------------|---------------|----------------|------------|--------------------|----------------------------------|------------------------------|-----------------------------|---------------------------|-------------------------------|---------------------------------|-----------------------------|
| | | 912.80 | 922.70 | 934.20 | .30 | 925.69 | 0.00 | 214. | 831. | 0.00 | 42.00 | 0.00 |
| | | 26. | 139. | 404. | .40 | 926.46 | 0.00 | 249. | 1129. | 0.00 | 41.83 | 0.00 |
| | | 0. | 0. | 6045. | .50 | 927.11 | 0.00 | 262. | 1435. | 0.00 | 41.67 | 0.00 |
| | | | | | .60 | 927.71 | 0.00 | 276. | 1736. | 0.00 | 41.67 | 0.00 |
| | | | | | .70 | 928.27 | 0.00 | 283. | 2036. | 0.00 | 41.67 | 0.00 |
| | | | | | .80 | 928.80 | 0.00 | 296. | 2335. | 0.00 | 41.67 | 0.00 |
| | | | | | .90 | 929.31 | 0.00 | 306. | 2634. | 0.00 | 41.67 | 0.00 |
| | | | | | 1.00 | 929.81 | 0.00 | 316. | 2935. | 0.00 | 41.50 | 0.00 |

OVERTOPPING ANALYSIS SUMMARY

PAGE D4 of 4

APPENDIX E
REGIONAL GEOLOGY

APPENDIX E REGIONAL GEOLOGY

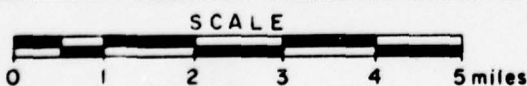
Pennsylvania Dam 479 is located between the Aunt Clara Dome and the Gillespie Dome. The strata strike northeast and dip approximately 70 feet per mile to the northwest. The stratigraphic column consists of members of the Upper Conemaugh Group, with shale, siltstone, and sandstone the primary rock type.

The lowest stratigraphic member of interest is the Pittsburgh red beds, a thick sequence of reddish claystone and shale. Above the red bed material is the Ames Limestone, a thin gray marine limestone which acts as a marker bed. The Ames Limestone crops at the surface or may be up to 15 feet below the surface in the vicinity of the dam. The Ames Limestone is usually highly jointed, and these joints may be open or filled with clay. These joints are usually interconnected with a possibility of piping along the fractures. Above the Ames are 22 feet of green-gray siltstone, 10 feet of calcareous shale, and 3 to 4 feet of a carbonaceous shale, which is equivalent to the Duquesne coal seam. Above the black shale is the Birmingham Shale, approximately 35 feet thick and consisting of a reddish claystone and shale, and then the Morgantown Sandstone. The Pittsburgh coal seam occurs approximately 215 feet above the Duquesne coal seam.

The only coal seam of economic interest is the Pittsburgh seam, which has been strip mined and deep mined on the ridges south of the dam and reservoir by the Superior Mining Company.

The Birmingham Shale is easily eroded and is known to be slide prone in the region. Approximately 20 percent of the surrounding area is covered by slide deposits and several recent as well as older slides have occurred near the dam.

| | | | | | |
|----------|-----|------------|--------|------------|--------|
| DRAWN BY | ACS | CHECKED BY | 2-6-77 | DRAWING 78 | 37-A19 |
| | | | | | |



PA 479, PA 482, PA 484, NEW, OLD
AND CHERRY VALLEY DAMS
GEOLOGY MAP

REFERENCE.

GREATER PITTSBURGH REGION GEOLOGIC MAP
COMPILED BY W.R. WAGNER, J.L. CRAFT, L. HEYMAN
AND J.A. HARPER, DATED 1975, SCALE 1:125,000

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 DRAFTER
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GROUP FORMATION

DESCRIPTION

| | | | |
|------------------|------------|-----|---|
| Alluvium | | Ol | Sand, gravel, clay. |
| Terrace deposits | | | Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation. |
| DUNKARD | Greene | | Cyclic sequences of sandstone, shale, red beds, thin limestones and coals. |
| | Washington | Pw | Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base. |
| | Waynesburg | | Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base. |
| MONONGAHELA | | Pm | Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base. |
| P: CONEMAUGH | Casselman | Pcc | Cyclic sequence of sandstone, shale, red beds and thin limestone and coal. |
| | Ames | | |
| | Glenshaw | Pcg | Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top. |
| ALLEGHENY | Vanport | | Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals. |
| | | Pa | |

GEOLOGY MAP LEGEND

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